An evaluation of alternative and augmentative systems of communication taught to nonverbal cerebral palsied children.

Udwin, Orlee

AN EVALUATION OF ALTERNATIVE AND AUGMENTATIVE SYSTEMS OF COMMUNICATION TAUGHT TO NONVERBAL CEREBRAL PALSIED CHILDREN

By

Orlee Udwin

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ABSTRACT

This study examines the impact of augmentative communication training on the communicative abilities of two groups of nonverbal cerebral palsied children - a group of 20 children learning Blissymbolics and a group of 20 children learning Makaton Signing, by following up their progress at six-monthly intervals over a total period of one-and-a-half years. The children's language and communication skills were assessed using formal tests of language expression and comprehension, measures of symbol and sign acquisition, recordings of the use of symbols/signs and speech in semi-structured conversational settings, and parent and teacher questionnaires. Measures of cognitive and perceptual skills, use of gesture, imitation, attending ability and behavioural adjustment, were also obtained.

The results revealed a depressing picture of poor augmentative system use, with limited vocabulary acquisition, few symbol/sign utterances being produced, and little generalization of system use outside of formal teaching sessions. Although there were measurable gains in these areas over time, the children continued to show critical gaps in their communication skills. Possible reasons for these findings are discussed in terms of subject and system characteristics, and the teaching practices adopted by schools. Recommendations are made for more intensive training and greater commitment by teachers and parents to sign/symbol use, and for the introduction of special teaching procedures to promote generalization.

Neither system facilitated greater communicative use than the other. However, there was wide variability among the children within each group, and regression procedures were used to identify predictors of subsequent progress. The implications of these results for system selection are addressed.

The children also showed severe deficits in their cognitive and perceptual abilities, representational skills, attending ability and spoken language. Most of these measures showed significant increases over time; but in the absence of control procedures, it is not possible to attribute these gains to the training programmes. It can be concluded only that such gains do occur in the context of augmentative communication programmes, and that sign and symbol use does not inhibit the development of speech.

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Chapter 1. Definition and Prevalence

The term 'cerebral palsy' is applied to a heterogeneous group of disorders which are characterized by various forms of motor dysfunction (Mitchell, 1961) and which differ widely in aetiology, pathology and associated clinical findings. Rutter, Graham and Yule (1970) have defined cerebral palsy as "an unequivocally pathological motor disorder in which there is evidence of a non-progressive lesion above the brain stem" (p. 109), while Mitchell (1961) and Ingram (1964) add the requirement that the defect or lesion be of the immature brain. Motor disorders which are transient, or are the result of progressive disease of the brain, or attributable to abnormalities of the spinal cord, are thus excluded from consideration. It must however be emphasized that the motor disabilities are only a part of a much wider syndrome of brain damage or defect which may also include such factors as epilepsy, mental retardation, and hearing and visual impairments (Mitchell,1961). Indeed, cerebral palsy usually involves a conglomeration of complex multiple handicaps, and a wide range of physical, sensory and intellectual disabilities may be present.

While it is not within the scope of this work to embark on a detailed discussion of the nature and aetiology of cerebral palsy, aspects of epidemiology will be briefly reviewed. Particular consideration will then be given to the nature of the language and communication handicaps of the cerebral palsied child, which are of direct relevance to the present investigation.

The classification of cerebral palsy is complicated by the wide variety of manifestations of the disorder, the lack of clear differentiation between them, and the fact that in individual children the manifestations tend to change as they grow older (Rutter, Graham and Yule, 1970). As a result, a varied terminology and classification of cerebral palsy is found in the literature. One of the most comprehensive schemes for classification was put forward by Perlstein (1952), who classified cerebral palsy according to anatomic site of the brain lesion, clinical symptoms, topographical involvement of extremities, degree of muscle tone, severity of involvement, and aetiology. The principal basis for classification, and the more popular one,has been according to clinical signs, as follows: spasticity, characterized by a rigidity of the muscles and exaggerated reflexes; ataxia, characterized by incoordination of movement and impaired balance; and dyskinesia, characterized by involuntary movements of the limbs. The latter category, as presented by Perlstein, included the conditions of athetosis, dystonia, tremor and rigidity, but some writers have considered each of these as a separate group for classification purposes. A category for mixed types of cerebral palsy is often also used, to refer to various combinations of the above types of disordered movement. Athetosis combined with spasticity, for example, or rigidity and ataxia, are frequently encountered (Cruickshank, 1976).

A number of writers further refine the classification to note the extremities involved in the spastic conditions. Wyllie (1951) proposed the following classification according to the number of limbs involved: congenital symmetrical diplegia (bilateral symmetrical paralysis, more severe in the lower limbs than the upper); congenital paraplegia (a mild form of the above in which the legs only are involved); quadriplegia (paresis of all four limbs, most marked in the upper limbs or of equal severity in all four limbs); triplegia (where three limbs are involved); hemiplegia (a unilateral paresis with both limbs on one side involved); and monoplegia (where one limb is affected). Finally, Perlstein (1952), Ingram (1964), Rutter, Graham and Yule (1970) and others include a severity of handicap rating, gauged by the extent to which the child's disability interferes with daily life.

Estimates of the incidence and prevalence of cerebral palsy have varied considerably. Estimates of the incidence at birth have ranged from 0.6 (Nilsonne, 1951) to 1.5 (Lundman, Tenenholtz and Galyas, 1978) to 5.9 per 1000 (New York State Joint Legislature, 1949 in Stephen and Hawks, 1974). Reports of the prevalence in children of school age have varied between rates of 3.4 and 4.8 per 1000, as reported in the New Jersey survey of 1938 (in Stephen and Hawks, 1974) to rates of 1 to 2 per 1000, as reported by Asher and Schonell (1950) in Birmingham, Woods (1957) in Bristol and Henderson (1961) in his survey in the Eastern region of Scotland. The detailed British studies of Ingram (1955), Mitchell (1961) and Rutter, Graham and Yule (1970) found rates per 1000 of 2.3, 2.0 and 2.6 (2.9 if postnatal cerebral palsy is included) respectively. Rutter et al. argued that the lower figures arrived at in some of the other studies were most likely due to cases having been missed through less thorough case finding techniques. They concluded that the true rate of cerebral palsy in the 1960s, at least in the U.K., probably lay between 2 and 3 per thousand. In general, variation in rates reported in different studies can be attributed to differences of definition and methodology, to inadequacies in case finding methods, and to chance variation. All studies have, however, found a slight preponderance of male to female cerebral palsied individuals, with Asher and Schonell's series (1950) and Rutter, Graham & Yule's (1970) containing 57% males, Dunsdon's (1952) 51% males, and Ingram's (1955) 60.5% males.

As regards the incidence of the different types of cerebral palsy, again different rates are quoted for different studies. There is, however general agreement in the literature that some 80% of all cerebral palsied individuals have spastic paralysis, that the hemiplegias comprise about one-third and the diplegias and quadriplegias one-half of all cases of cerebral palsy, and that dyskinesia and ataxia are relatively uncommon (Ingram, 1955; Mitchell, 1961; Perlstein and Hood, 1957; Rutter, Graham and Yule, 1970). This picture may well be changing in recent years, however, with significant decreases in the number of cases of diplegia and dyskinesia being reported in the 1970s and 1980s (Hagberg, Hagberg and Olow, 1975). Hagberg et al. relate these decreases to decreases in the incidence of cases with very low birth weight and with perinatal causes. Direct comparison between studies on severity of handicap measures is even more difficult, because the composition of cases differs from study to study, as do the criteria used to assess this measure. Nevertheless, Rutter, Graham and Yule, (1970), Ingram (1955) and Schonell (1956) all found that 31% to 37% of their samples could be characterized as severely to very severely handicapped, i.e. needing substantial help with daily activities.

Two recent studies have examined changes in the incidence of cerebral palsy over time. Hagberg, Hagberg and Olow (1975) found that the incidence per 1000 live births in one region in Sweden fell from 2.2 in 1954/8 to 1.3 in 1967/70, the main decrease (as already noted) being in the categories of diplegia and dyskinesia. Stanley (1979) found that the incidence rate in Western Australia was high throughout the 1960s, peaking at 3.9 per 1000 in 1967, and then falling steadily to 1.2 per 1000 in 1975. Stanley attributes these findings to the improvement in birthweight distribution of all births, improved maternal health and improved obstetric care, and points out that the results do not bear out the concern that falls in neonatal mortality rates would result in a rise in handicap in surviving infants. More recently, however, Paneth and Kiely (1984, in Stanley and Alberman, 1984) have cautioned that there is at present little firm evidence to support claims of a general decline in rates of cerebral palsy.

Turning finally, and in brief, to the question of aetiology, Woods (1969) notes that as any developmental abnormality, infection or injury to the brain occurring before, during or after birth, may affect the areas concerned with movement, the field of cerebral palsy is wide and its causes are various. She suggests that possibly in 5% of cases the condition is genetic. Maternal disorders or illnesses in pregnancy such as rubella or toxaemia may also lead to cerebral palsy. In as high as 75% of all cases there is a history of an abnormal birth, asphyxia or a neonatal illness such as meningitis or encephalitis. There is a high incidence of prematurity and low birthweight in cerebral palsy, while rarer causes include brain damage due to carbon monoxide poisoning, a severe reaction to immunisation and road accidents (Ingram, 1964; Woods, 1969). As has been found by Mitchell (1961) and others, the various causes differ in their importance in accounting for cerebral palsy subtypes. A number of writers have argued for an upper age limit of three years to the occurrence of cerebral palsy (Hansen, 1960), or at least required that diagnosis be limited to occurrence in the first few years of life. Mitchell (1961), however, states that as the growth and development of the brain is not complete until late adolescence, it is undesirable to impose a limit at an earlier age and cerebral palsy can occur at any stage before full maturity of the central nervous system is reached. If this argument is accepted, it must be recognized that the effect of a lesion of the brain during the stage of rapid development would create different problems from those resulting from a lesion acquired at a later stage. Moreover, the disability of the child who has never acquired a skill differs from that of the child who has had the skill and lost it.

Chapter 2. Associated Handicaps in Cerebral Palsy

There is a tendency for individuals with cerebral palsy to have more, and a wider variety of concomitant defects than can be found in the general population (Stephen and Hawks, 1974). In addition to the physical handicaps, there is often some general or specific intellectual impairment; there may be perceptual and sensory handicaps, epilepsy, emotional disturbance, and speech and language handicaps (these latter are to be discussed in the following chapter). Each individual will have a different combination of handicaps, varying in type and severity, some of which may be concomitant results of the brain damage, others resulting from the person's response to his condition, the responses of others, and/or the physical handicaps themselves and the limitations they impose (Coombes, 1984).

Most surveys agree that generalized intellectual impairment is very common in cerebral palsied children, and that many of those with higher intellectual levels show learning problems of varying degrees of severity (Mittler, 1970). Rutter, Graham and Yule (1970) found that about one-third of cerebral palsied school children on the Isle of Wight had IQs below 50 or 55, about one-fifth had mild intellectual retardation (IQ 50/55 - 69), and about one fifth had an IQ of 100 or more. The results of intelligence tests from such surveys must be considered highly tentative - the difficulties of intelligence testing with the cerebral palsied are well known and, moreover, the basis of evaluation of intelligence varies from study to study, and even within studies, from subject to subject. Nevertheless, the findings from other studies of cerebral palsy are broadly similar (e.g. Cockburn, 1961; Dunsdon, 1952; Ingram, 1964).

The IQ distribution is very different for different types of cerebral palsy. While a number of surveys have found no difference between the mean IQs of athetoids and spastics (Dunsdon, 1952; Schonell, 1956), Ingram (1975) notes that more athetoids are of average or superior intelligence than are those in other categories of cerebral palsy. All writers do, however, agree on the tendency for severity of physical handicap to be associated with severity of mental handicap. Thus children with hemiplegia are found to have only a slight excess with low intelligence; diplegic children are more often intellectually retarded, and all or nearly all children with bilateral hemiplegia (who are the most extensively handicapped among spastic cerebral palsied individuals) tend to have the lowest IQs (e.g. Cockburn, 1961; Rutter, Graham and Yule, 1970).

The few relevant studies conducted to date further indicate that cerebral palsied children tend to be educationally retarded and to have a high rate of reading problems, even when they are of normal intelligence. In Floyer's (1955) cerebral palsied sample, 62% showed an average reading retardation of nearly two years. In arithmetic, 88% showed an average retardation of three years relative to mental age. Of Cockburn's (1961) 153 cases who were over 7 years of age, 73% were able to make some score in reading; but of these almost two-thirds scored below the level expected for their ability. Again, better attainment tended to be associated with higher intelligence and milder handicaps. Rutter, Graham and Yule (1970) found that 41% of their Isle of Wight sample of cerebral palsied children were at least two years retarded in reading comprehension, even allowing for their general intelligence. Ingram (1964) also found specific learning difficulties in a group of 6 - to 11-year-old cerebral palsied children of average intelligence. The children showed particular difficulty in recognizing the shape, orientation and relationship of letters and small words; letter and word reversals were noted, as was a tendency to reverse the order of words in a sentence when reading and to omit small words. One interesting observation, which requires further study, is that the act of reading itself, which is normally carried out by a series of saccadic eye movements with fixation pauses, may present special difficulties to the cerebral palsied. Mitchell (1961) points out that they read in a jerky scanning fashion and that the fixation pauses, during which perception takes place, are increased in length.

Many factors are likely to be involved in the poor educational attainment of cerebral palsied children. Rutter et al.were able to rule out intellectual level, school absence rates and the presence of a physical handicap per se as the explanations, in view of their finding of significantly higher rates of reading retardation in this group when compared with a random control group. even after taking IQ into account, and when compared with a group of physically handicapped children with similar rates of school absence whose physical disorders did not involve the brain. They conclude that the poorer reading achievement in the cerebral palsied group is probably due in part to the direct effects of brain dysfunction. Other factors likely to be involved include language and perceptual disorders, and the inability to posture advantageously for focusing when reading. There also seems to be general agreement that attention difficulties may be among the very real learning handicaps suffered by children with cerebral palsy (Holt and Reynell, 1967). About one-third of Woods' (1957) hemiplegic sample were said to be distractible and hyperactive. Ingram (1955), however, classed only 7.7% of his sample as having severe overactivity and impaired concentration. Differences in criteria and samples used are likely to explain such disparities.

The incidence of significant visual handicaps in cerebral palsy has been estimated at a quarter to a half of all cases. Breakey (1955) found only 44% of his patients to have normal eyes and vision. In Henderson's (1961) series of 166 cases examined opthalmologically, 8.4% were blind and 5.1% partially sighted. It was further found that severe visual, mental and physical handicaps are closely associated. A very high proportion of the blind and partially sighted were low-grade mental defectives suffering from severe spastic tetraplegia. Strabismus was found in 45% and nystagmus in 13% of cases. Other abnormalities, including optic atrophy, homonymous hemianopia and abnormalities of the choroid and retina, were also found. Only 41.6% of cases could be considered normal from an opthalmological point of view. Rutter, Graham and Yule (1970) found somewhat lower rates of visual impairment, with 29% of their cerebral palsied group having some type of visual defect. Strabismus was present in about one-third of cases, and 4 of their 35 cases were blind or nearly blind.

It has been widely recognized that cerebral palsied children tend also to suffer from a variety of defects of visual perception apart from the peripheral sensory ones. This is because, firstly, the agent responsible for the cerebral palsy can also damage the visual functions and, secondly, because early perceptual development is disturbed by the motor and other defects shown by the child, which limit opportunities for learning by exploration of the world and by moving around and touching and investigating objects. Holt and Reynell (1967) describe just two ways in which visual development may be disturbed. Some children, for example, are unable to stabilise their head position; their eyes thus never have a stable position from which to search their environment and learn clues for orientation. Another example relates to the difficulty of coordinating the direction of gaze and of hand movement. Disorders of visual perception in cerebral palsy include inability accurately to locate the position of objects in space and accurately to move in space, and body image disturbances. The occurrence of such visual perception defects is clearly important because of their relevance to learning and development.

As most of the aetiological agents of cerebral palsy can concomitantly cause damage to the auditory mechanism, there is also a significantly greater incidence of hearing impairment in this group than in the non-handicapped population. In addition, the cerebral palsied may be more susceptible to the adventitious childhood diseases that also produce hearing loss (Lencione, 1976). Estimates of hearing loss in this group show a wide variation. One reason relates to the criteria used to determine the presence and extent of such loss. A second reason is that without careful examination cases may be missed and a spuriously low incidence reported. Holt and Reynell (1967) suggest that this may account for the relatively low prevalence of deafness reported by Asher and Schonell (1950) (3%), Barclay (1956) (4%) and Woods (1957) (7%). Using more systematic investigation techniques, Fisch (1957), Holt and Reynell (1967) and Mowatt (1961) all found some hearing loss in about one-quarter of cases, and severe hearing loss in 6 to 16% of their cerebral palsied series. The prevalence of hearing loss and of high-tone deafness is particularly high in cases of athetosis (Mowatt, 1961; Perlstein, 1952; Yoder and Calculator, 1981). Mowatt further found the incidence of deafness to vary directly with degree of physical and mental handicap, as is the case with visual impairment too. Holt and Reynell point out that while some cerebral palsied individuals are deaf, others may suffer a distortion of their hearing development as a result of their motor handicap. For example, delayed and impaired development of head control can lead to difficulty in the localisation of sounds. Clearly, the most handicapping effect of impaired hearing is on speech reception and therefore on language development, learning and communication.

Between 29% and 40% of cerebral palsied children have been reported as having a history of one or more epileptic fits, not counting those with convulsions in the first two weeks of life (e.g. Ingram, 1964; Rutter, Graham and Yule, 1970). Both Dunsdon (1952) and Hansen (1960) found the incidence of seizures to increase as the level of intelligence decreased.

Many writers have further noted the frequency with which psychiatric problems occur in association with cerebral palsy. Based on teacher reports, Dunsdon (1952) found that of 16 cerebral palsied children with IQs below 70, only two seemed 'reasonably stable'. Of 50 children with IQs above 70, instability was noted in 38%. Floyer (1955) found that 42% of 100 cerebral palsied children showed 'excessive emotionality', including distractibility and disinhibition, and social immaturity, although her procedure is not very clear. Oswin (1967) cites a host of other writers who presented similar descriptions of the cerebral palsied child.

Based on information from interviews and questionnaires, Rutter, Graham and Yule (1970) found that the rate of psychiatric disorder among their group of neuro-epileptic children on the Isle of Wight (including a cerebral palsied group but excluding children with severe subnormality) was very much higher (34.3%) than the rate in the general population of children (6.8%) and than children with chronic physical disorders not involving the brain (11.6%). A similar picture has emerged from the work of Pilling (1973) and Seidel, Chadwick and Rutter (1975). Rutter, Graham and Yule further found that the majority of children with brain lesions (excluding those under the mental subnormality services) had neurotic or antisocial disorders. The severely mentally retarded, whether or not they had cerebral palsy, showed a very high rate of psychiatric disorder, and in this group the hyperkinetic syndrome and psychosis were much more frequent than in the general population.

Rutter, Graham and Yule found no significant association between severity of handicap and the likelihood of psychiatric disorder; nor was the visibility of the handicap a major factor, in that psychiatric disorder was no more frequent in the children with visible handicaps and lesions below the brain stem than in children with other non-neurological disorders but few visible disabilities. Low intelligence was important, but even when comparisons were restricted to children with IQs above 86, the rate of psychiatric disorder in the neuro-epileptic group was still more than double that in the group of children with other chronic physical handicaps. Rutter et al.were thus led to conclude that it is the presence of organic brain dysfunction per se which results in the cerebral palsied child's greatly increased susceptibility to psychiatric problems.

Although brain damage clearly increases the risk of psychiatric disorder in cerebral palsied children, there are a host of other factors that are also likely to play a part. These may include the frustrations inherent in physical restrictions, adverse parental reactions to the child's handicap, perceptual abnormalities, the effects of drugs, the child's reactions to his disability, and poor speech and language resulting in the child not being able to express his needs and wants adequately (Rutter, Graham and Yule, 1970). These language and communication difficulties constitute the focus of the following chapter.

Chapter 3. Language Development and Language Impairment in Cerebral Palsied Children

Impairments of speech and language are found among a large proportion of cerebral palsied children. These impairments may range from a mild dysarthria or language delay to a complete inability to speak, and they can be amongst the most disabling handicaps encountered in cerebral palsy. There are a number of different conditions that may contribute to the speech and language deficits, and these will be briefly discussed below.

Language makes a basic demand on the motor behaviours of an individual. Phones must be articulated; phonemes must be assembled into morphemes; and syntax must be realized in a series of rapid, highly differentiated movements of the tongue, lips, palate and larynx (McLean, 1976). The neurological disorder in cerebral palsy can result in impairment of the control of voluntary movement of these articulatory organs during speech. There are a number of reasons why the physiological mechanisms of vocalisation and articulation might be disturbed in cerebral palsied children (Holt and Reynell, 1967). These include impaired breath flow from the lungs; impaired control of the vocal cords; inefficient palatal function; and defective articulation due to spasticity, weakness or in-coordination of the musculature affecting the movement of the soft palate, tongue and lips. As elaborated by McDonald (1980a), some children are unable to move beyond the stage of equal duration of inspiration and expiration and make the change needed to support speech production, whereby inspiration is performed very rapidly and exhalation is prolonged. They may be unable to produce the quick inhalation or, if they can, they may be unable to coordinate exhalation and vocalization. Harris - Vanderheiden Lippert, Yoder and Vanderheiden (1979) point to vocal disturbances in the sense of 'petering out', or delay or blocking of voice because of spasm of the breathing and voice organs; to disturbances of the flow of speech in the form of fragmented speech, strange breathing intervals or odd connections of sentences, because of superficial or arhythmic breathing spasms of the diaphragm, and fluctuating muscle tone; and to nasal speech, because of insufficient control of the velum, which makes the voice escape through the nose. Often, the greater the desire to communicate, the more tense the child may become, and the less successful are the attempts at speech (McDonald and Schultz, 1973).

The child may further have a history of feeding difficulties with defective patterns of chewing, sucking and swallowing, indicating that it may be very difficult, if not impossible, to develop intelligible speech. A number of writers, including Ferrier and Shane (1983), have pointed out that the use of the oral musculature for speech depends on its previous successful use for feeding. Feeding itself shows a developmental evolution from an obligatory system of life sustaining reflexes to a system of voluntary control of the oral musculature, upon which speech movements will later be built. Feeding difficulties are thus likely to predict later speech difficulties. Indeed, in a study of sixty cerebral palsied adults and children, Love, Hagerman and Taimi (1980) found that the individuals with adequate feeding skills achieved significantly better levels of rated speech and articulation proficiency than those with inadequate feeding skills. Although the presence and number of dysphagic symptoms was not found to predict lack of speech precisely, indicating the presence of other contributory causes as well, the trend revealed in this study confirms the relevance of feeding difficulties to speech impairment.

On the basis of research studies and wide clinical experience, Ingram (1972, 1975) has presented detailed descriptions of the common pictures of dysarthria in cerebral palsy subtypes. Spastic children with paretic involvement of the bulbar musculature tend to have a slow, laboured pattern of speech, and great difficulty in changing the position of the lips, tongue and palate to produce new sounds. Such children, says Ingram, will often have an early history of feeding difficulties; there may be a tendency to regurgitation, slow feeding from the bottle, and apparent difficulties in swallowing. Most are slow to learn to chew solids and drooling is common. On neurological examination there is usually a poverty of facial movement and a greater or lesser degree of loss of voluntary movement patterns in the lips, tongue and palate. By contrast, involuntary activities involving extensive movements of the lips, tongue and palate may be carried out, for example in sneezing, or the tongue coming forward involuntarily in feeding.

Ingram notes that dysarthria occurs relatively rarely in cases of unilateral hemiplegia, but severe dysarthria is almost invariable in individuals with bilateral hemiplegia. In diplegic cerebral palsy the degree of involvement of the bulbar musculature varies considerably, but when the upper limbs are affected dysarthria is nearly always present.

In ataxic cerebral palsy without associated diplegia the weakness and incoordination of voluntary movements present in the limbs is also present in voluntary movements of the lips, tongue and palate. In a significant proportion of ataxics Ingram has found considerable delay in the development of speech, even when comprehension appears to be intact. When speech does appear, there are likely to be considerable difficulties in the articulation of consonant clusters, vowel formants are rather inconsistent, and speech tends to be slow. Neurological examination reveals weakness, incoordination, intention tremor, hypotonia and unsteadiness in the face, palate and tongue, as well as in the limbs and trunk.

In ataxic diplegia the nature of the dysarthria is found by Ingram to vary according to the relative severity of the ataxic and diplegic components. When the ataxia is predominant and the diplegia mild, the speech disorder is very similar to that found in ataxic patients. When the spastic diplegia is more important than the ataxia, the speech is more like that found in diplegic cerebral palsy. In the majority of cases, however, the disorder, as described by Ingram, is manifest by a mixture of the scanning, slow speech characteristic of the ataxic and the slow, laboured speech of the spastic, with the characteristic difficulties in accurately producing consonants and consonant clusters. In addition, since a high proportion of ataxic diplegics are mentally retarded, there is likely to be delayed and slow speech development.

Ingram then turns to discuss speech impairment in dyskinesia and notes that the same sudden, involuntary changes of tone and involuntary movements that disrupt attempted voluntary movements in the limbs affect the lips, tongue and palate. Dysarthria affects a higher proportion of dyskinetic individuals than those suffering from any other type of cerebral palsy except bilateral hemiplegia. Moreover, the dysarthric disorder tends to be very severe and particularly frustrating for these children because more of them are of average or superior intelligence than individuals in other categories of cerebral palsy. Ingram describes the large variety of sound distortions, irregularities, omissions and abnormalities of intonational patterns and rhythm that occur in dyskinesia. These are characterized by their variability from moment to moment as the patterns of involuntary movement of the lips, tongue, palate, larynx and respiratory musculature occur. Many individuals have difficulties in initiating a first syllable and are unable to control the word sound uttered. This may or may not be followed by a sequence of other syllables, depending on the degree of associated dysrhythmia and involuntary glottal closure, and the violence of associated body movements (Ingram, 1972, 1975).

In some instances individuals with severe impairment of the respiratory, phonatory and/or articulatory musculature, have either minimal or no impairment of cognitive and linguistic processes. In other cases language comprehension is also impaired, and this may well be, at least in part, a secondary consequence of the speech disorder. It should however be emphasized that dysarthria is not the most important cause of language impairment in cerebral palsy (Ingram, 1975). There are a number of other factors occurring in isolation or in combination which are more frequent causes; and it is often very difficult to assess the relative contribution of each in the causation of speech and language disorders. These factors include mental retardation, hearing difficulties, verbal apraxia and developmental language disorders. Ingram also makes reference to the possible role played by such problems as abnormalities of self-monitoring and auditory feedback, but very little is as yet known about such difficulties.

In addition, because of their handicaps, cerebral palsied children are likely to experience a degree of linguistic deprivation in infancy and early childhood, which will also contribute to their language and communication deficits. Kilburg (1980, in Carlson and George, 1982) considers the factors likely to be involved as follows: Because of their severe physical handicaps, the ability of cerebral palsied children to interact with and manipulate their environments is limited, which in turn limits the experiences that are the basis for later language concepts, as well as limiting opportunities for communication. The recent literature indicates that the infant is the initiator of much parent-child interaction (e.g. Bates, 1976). The cognitive, motor and perceptual problems of the cerebral palsied child frequently interfere with or distort the child's attempts to start or maintain interactions, thus reducing the number of communicative interactions that can occur. For language to develop the environment must provide appropriate stimulation for the child and reinforce communication attempts. In the case of cerebral palsied children insensitivity to their nonspeech communicative and interactive behaviour, and lack of positive reinforcement for other than correct verbal communication, may seriously inhibit the development of communication. Further, the caregivers often do not get positive feedback from their efforts to communicate with the child and so do not get the kind of reinforcement they need to continue this stimulation. In fact, the child's efforts to respond may be so bizarre that the caregivers interact less with the child. In many cases motor behaviours may interfere with routine care such as feeding, caregivers may react negatively to the child, and tension and frustration may arise in situations which, with the able bodied, are usually reinforcing. Too frequently all the child's needs are anticipated; there is little opportunity for the child to control events or participate in decision making, and patterns of passivity and lack of motivation to communicate are the result.

Estimates of the prevalence of disorders of communication in cerebral palsy are complicated by problems of definition, lack of consensus on criteria, varying degrees of competency in diagnosis and assessment, and differences in composition of the series of cases studied. Overall, studies have shown that one-half to two-thirds of cerebral palsied individuals have severe communication difficulties. In an early study, Achilles (1955, 1956) reported that 66% of his cases, aged 2 to 22 years, had no speech or the equivalent of no more than one year of spoken language development, that 20% of his subjects had sufficient facility to indicate basic needs, and that only 14% had speech that could be characterized as good. However, Cockburn (1961) and Rutter, Graham and Yule (1970) found no intelligible speech in 19% and 23% of cases respectively. Clearly, prevalence rates will vary depending on composition of the series studied. Defective speech sound production is particularly prevalent among children with dyskinesia. Thus series with large numbers of dyskinetic cases would show a high proportion of cases with defective speech. Similarly, if account is taken of minor aberrations of speech sound production, much higher rates of speech abnormalities will be found (Ingram, 1964). Thus Dunsdon (1952) found that 79% of her series had defective speech, but Hansen (1960) and Ingram (1955), who both accepted intelligible speech as 'normal' even if all speech sounds were not correctly produced, found that around half of their series had significant speech defects.

The (disappointingly few) developmental studies conducted to date indicate that cerebral palsied children show an average delay, in comparison with normal children, of from several months to many years in their passing of different language milestones (Bonvillian and Nelson, 1982). Dunsdon (1952) found an average retardation of vocabulary and verbal recall of 3 to 4 years as compared with normal children. Byrne (1959) examined a group of 74 athetoid and spastic children aged 2 to 7 years, over half being of average to above average intelligence. Although all the children were seriously retarded on the accuracy of consonants, they had nevertheless developed earliest those sounds which also appear first in normal children. The 61 children who had more than 20 words were on average three months behind normals in their use of single words, one year behind in their use of two-word sentences, and four years behind in their use of three-word sentences. Language development and articulatory skills were thus delayed but were said to follow the same sequential pattern as is observed in normal children.

It has already been emphasized that it is important to consider speech and language defects as they occur in the different types of cerebral palsy, and the different patterns of speech defect described by Ingram (1975) as characteristic of the different subtypes were outlined above. In their survey of 258 cerebral palsied children, Ingram and Bam (1961) found that normal speech was more commonly found in children with hemiplegia (in 33%) than in those with any other type of cerebral palsy. The commonest disorder in this group was retardation of speech development, found in 54% of hemiplegics, mostly in association with mental retardation. In bilateral hemiplegia dysarthria was always present and, since most cases with bilateral hemiplegia are severely mentally retarded, associated speech retardation was common. Of diplegics, 53% had retarded speech development, while 44% were dysarthric. Most children with ataxia had defective speech, with simple retardation of speech development being most common. Dysarthria was also common in the children with congenital cerebellar ataxia. More than half of the children with ataxic diplegia and one-third of the children with congenital cerebellar ataxia had only single words or no speech at age 4 years. Very few dyskinetic children speak normally. Woods (1957) found 28 of 33 athetoids to have defective speech, while Ingram and Bam (1961) found that all 67 of their dyskinetic cases had speech defects and just under half had no speech or had severe speech defects. In 78% of cases there were multiple causes, which included hearing impairment, defective motor control of the lips, tongue and palate, difficulties in respiratory coordination and mental retardation. However, retarded speech development secondary to mental retardation was less common than in other categories of cerebral palsy, because mental deficit is less prevalent in dyskinesia.

In general, language problems are much more common in cerebral palsy in children with severe intellectual retardation than in those with normal or only mildly subnormal intelligence. Rutter, Graham and Yule (1970) found that in children with IQs above 50 only 2 in 5 showed language retardation of some degree, and in most of these the language handicap was mild or moderate rather than severe. Of the 42 cases with no intelligible speech in Cockburn's (1961) sample, 33 had IQs below 50.

It must be noted that the studies discussed in the preceeding paragraphs were almost without exception concerned with enumerating general prevalence figures of the presence of speech and its intelligibility in the cerebral palsied population. Almost nothing is known about the language development and comprehension abilities of cerebral palsied children or about their functional use of language, and there is little understanding of the effects of nonspeech conditions on language development and communication in general in this population. The present study, which has as one of its aims the examination of language development in nonverbal cerebral palsied children of school age, will, it is hoped, make a contribution towards filling this gap in the cerebral palsy literature.

Before turning to the question of language intervention with cerebral palsied and other language handicapped groups, it was thought worthwile to devote some space to considering the importance of the role played by language and communication in development in general. The presence of a physical handicap poses many special problems to the child. And, as was pointed out by Loring (1965), where the disability also affects speech and language development, it constitutes the most severe barrier to cognitive, social and emotional growth.

In the first place, language is a critical interactive component to cognitive development in the early pre-school years (Rutter and Martin, 1972). As described by Cooper, Moodley and Reynell (1978), language is an intellectual process which, in the pre-school years, becomes integrated with other intellectual areas so that the whole process of thinking becomes extended and enhanced. Luria (1961) and others have shown that at about three-and-a-half years of age language becomes important as a directive function for practical activities. By their use of language children become able to plan and monitor their activities, so extending their range of abilities. Later, Cooper et al.continue, this use of language is internalized so that it becomes a substitute for the action itself and an aid to problem solving. Francis-Williams (1973) and others have also shown that language plays a role in the formation of concepts and in the processes of symbolisation and abstraction that the child must subsequently use in both social and educational pursuits such as reading, writing and logical thinking. Current theories of cognitive development stress the importance of active participation in the environment. The non-manipulative, non-ambulatory cerebral palsied child is unable to participate in typical infant exploratory activities. For such a child, the primary mechanism for exploration and learning about the world must, therefore, be through communication-through questioning or through directing the actions of others (Vanderheiden and Luster, 1975). Yet this type of exploration is reduced or at worst impossible for language impaired and non-communicating physically handicapped children.

The effect of language deficits on development is not only an intellectual one. The use of language increases both the quantity and quality of interactions with other people, and thus plays a crucial role in psycho-social development and emotional adjustment. The child with impaired language will thus be limited in the extent and quality of interactions with others, and will have less opportunity to learn from others and to develop socially and emotionally. Hagen (1978) has stated that the basic purpose of communication is to transmit one's needs, wants, feelings and thoughts to another person and to share experiences of others. He adds that through communication we are able to make ourselves known to others and thereby establish feelings of identity and self esteem and some degree of control over our environment. It is commonly observed that when children are unable to make themselves understood and to express even basic needs and wants, frustration will result, which can in turn engender behavioural and emotional problems. Deich and Hodges (1982) further point out that deficiencies in language will also frustrate caregivers, who often fail to understand the needs and emotions of their charges. Such frustration in turn has a negative influence on caregiver-child interaction. At school age additional problems are likely to arise from a failure of communication with peers and teachers.

Language handicapped cerebral palsied children, limited as they are by their physical handicaps and lacking adequate means of self-expression, experience a loss of control over their world. They are, in the words of Sheridan (1972), condemned to a life of intellectual silence and emotional solitude. It is thus not surprising to find in some of the most severe cases generalized passivity and little motivation to interact with others. While in many cases the nonverbal child and his parents are likely to have evolved some sort of signal system involving gestures, vocalization, facial expression or eye movements, such means are extremely crude and limiting and do not readily transfer to other people. It is this group of cerebral palsied children, for whom an adequate oral mode for language is highly problematic, which constitutes the focus of the present investigation. Providing such individuals with effective communication systems is clearly a priority.

PART II: ALTERNATIVE AND AUGMENTATIVE SYSTEMS OF COMMUNICATION

Chapter 4. Introduction - Setting the Scene

A poor prognosis for speech communication can result from a number of different conditions. These include: 1. Dysarthria, which was discussed in the preceeding chapter in relation to cerebral palsy, and which refers to an impairment in the functioning of the musculature of respiration, phonation and articulation due to a lesion or lesions in the peripheral nervous system, the central nervous system, or both. 2. Verbal apraxia, a condition resulting from brain damage which prevents the production of the muscle gestures required for speech on a voluntary level. 3. Linguistically based disorders, including developmental language disorders and aphasia with impairment in one or more aspects of symbol formulation and expression. The aspects of language behaviour in which there may be a deficit include speech expression and comprehension, reading and writing. 4. Deafness. 5. Mental handicap. There is a close relationship between severity of retardation and difficulty in communicating, with Spreen (1965) estimating 100% language difficulties at IQs below 20, 90% difficulty at IQs of 21 to 50, and 45% difficulty in the mildly retarded IQ range. 6. Autism, with about 50% of autistic children failing to acquire speech, and most of those who do speak showing abnormal speech patterns (Rutter, 1966). 7. Emotional conditions, including elective mutism; and 8. Structural impairment, including glossectomy and laryngectomy (Silverman, 1980). As was stressed in the previous chapter with reference to cerebral palsy, these conditions are not mutually exclusive; many individuals have multiple impairments that contribute to the communicative disorder.

Until the 1970's treatment techniques for nonverbal and language impaired children were fundamentally oral methods, focusing on facilitating the understanding and use of vocal speech. It has been pointed out by Luftig (1982) that the use of these techniques was often predicated on the assumption that oral language is the most natural form of communication for humans, and thus is easiest for humans to learn. To date a sizeable body of experimental work and carefully designed programmes are available on developing oral communication in autistic and profoundly and severely retarded children (e.g. Lovaas, Berberich, Perloff et al, 1966). Typically, operant conditioning methods have been used, with the first step in training programmes usually involving the establishment of vocal imitation. However, initial optimism about the prospect of teaching functional speech and language to nonverbal children has been tempered by several realizations (Goetz, Schuler and Sailor, 1979). Many children require thousands of learning trials over a period of years to acquire basic speech skills, while others fail to acquire even speech imitation skills. The training techniques employed have sometimes been successful with children who have some productive or echolalic speech, but the procedures have proved ineffective or at best extremely time-consuming with children who at the outset were mute or lacked vocal imitation skills. In addition, none of these attempts has been successful in generating generalization to new language situations (Sailor, Guess and Baer, 1973).

In the case of the dysarthric cerebral palsied child, too, therapy had, until quite recently, dealt almost exclusively with attempts at improving articulation and establishing sounds or words in these children (e.g. Irwin, 1972). Efforts towards modifying aberrant patterns of neuromuscular control and coordination have involved exercises for breathing, phonation and articulation. In prespeech stages training has often been aimed at reversing or reducing such aberrant patterns by instituting feeding programmes to improve chewing, swallowing and sucking, in the belief that a significant effect of the amelioration of dysphagic symptoms is a reduction in the probability of future dysarthria (Love, Hagerman and Taimi, 1980). This belief is based on the assumption that movements of the oropharyngeal musculature in feeding are directly related to speech movements. More recently, however, Hagen, Porter and Brink (1973), Schiefelbusch (1984) and many other writers have questioned whether therapy oriented toward establishing intelligible speech is reasonable for cerebral palsied children whose neuromuscular involvement is so severe that they are unable to control respiration and phonation, let alone their articulator musculature. They argue further that it is unnecessary and irresponsible for clinicians to insist on oral language as the only goal for training, thereby depriving these children of other possible means of communication during the early years, which are so crucial for language development. While the oral approaches may bring about some positive changes in the speech production musculature, such changes are usually not of sufficient magnitude to render speech a functional mode of communication (Hagen et al., 1973; Morley, in Renfrew and Murphy, 1964). Love et al.'s (1980) findings of a positive relationship between dysphagic symptoms and measures of speech proficiency in a group of cerebral palsied children and adults would tend to confirm the value of the prescription to improve feeding patterns in the prespeech period. But even they stress that oromotor training techniques may be disappointing in all but the milder cases of motor involvement of the oral musculature.

Apart from motor speech therapy, which was often futile, the 1960's saw the appearance of a handful of descriptive and anecdotal studies on the use of typing and word and letter communication boards with nonverbal cerebral palsied children (Feallock, 1958; Sayre, 1963). These early case studies relied on traditional orthography and were intended for severely physically handicapped individuals with normal or near normal receptive language skills and with reading and spelling skills. But there remained the problem of how to deal with those nonverbal individuals who are unable to acquire speech in spite of often great systematic effort, and who may never be able to use advanced orthographic systems for communication. In the past fifteen years consideration has begun to be given to a wide variety of nonverbal communication systems for these individuals, and an increasing body of clinical and empirical evidence exists which indicates that the use of such systems can facilitate language development in non-speaking persons with whom traditional approaches have failed. These systems will be discussed in greater detail below, but first a brief survey will be presented of the changing climate in which these augmentative approaches have come to be accepted.

As already mentioned, the increasing interest in, and acceptance of, alternative and augmentative communication modes in the 1970's was due in part to the growing recognition of the failure of attempts to teach functional speech to a significant percentage of the nonverbal population. There were also a number of other developments taking place in the 1960's and 70's which helped to stimulate interest in this field as an acceptable and exciting area of clinical and scientific investigation. In the first place, the normal model of language development, upon which remedial approaches to language impairment were traditionally based, underwent dramatic changes in the 1970's (Bloom and Lahey, 1978; Kiernan, 1982). At this time there was a reconceptualization of the nature of language itself; 'speech' came to be seen as representing the output mode conventionally used for communication exchange, and as quite distinct from 'language', which is a symbolic code that allows the generation of novel messages which would be understandable to anyone who knows the code. Thus the physical (i.e. auditory-temporal) character of speech was no longer held to be a necessary element in the definition of a linguistic communication system (Remington and Light, 1983). Linguists and clinicians shifted their focus from the speech act to the communication act, from a study of structure to a consideration of the use of language, its functions and pragmatics, and to an emphasis on nonverbal behaviour as part of the communicative process (e.g. Bloom, 1970; Dore, 1977).

With improved understanding of the distinction between speech and language, and with the growing emphasis on the much broader area of communication, the philosophy toward the treatment of nonspeaking children radically changed. Thus, many of the sign languages used by deaf people were, by 1970, beginning to be accepted as true languages. Until this time (and in some cases still today) there was a prejudice against signs, which were viewed as alinguistic, concrete and crude systems of signals and gestures. This traditional position, and the assumption that all languages are primarily spoken and that other forms of communication are imperfect outgrowths of a basic spoken system, was strongly challenged by Stokoe (1972), who was the first to demonstrate that American Sign Language is a linguistic system with all the important characteristics of a true 'language'.

Stokoe's work was instrumental in establishing a climate of acceptance of manual communication in the classroom. Further support was obtained from the results of several studies conducted around that time with primates, which demonstrated that signs and symbols could be used to train nonverbal organisms to operate linguistically (Remington and Light, 1983). In the classic study of Gardner and Gardner (1969), a chimpanzee called Washoe was trained to use 30 signs appropriately and spontaneously over 22 months. Concurrent with the Gardners' work, Premack (1971) was able to teach a chimpanzee to 'communicate' using a set of plastic symbols, thereby circumventing the chimpanzee's physiologic inability to produce sounds. These studies, together with the increased emphasis during the 1960's on rehabilitation programmes for retarded individuals, and some early studies on the use of manual communication with the deaf retarded, all gave further impetus to the exploration of sign and symbol systems as possible modes of communication for individuals with normal hearing but severe language handicaps, and paved the way for what Kiernan (1982) has called the "revolution" in methods of teaching language impaired children.

Nonspeech communication modes can be defined as "procedures for encoding and transmitting messages without their being directly encoded into phonemes by the vocal tract" (Silverman, 1980, p. 3). There are a number of methods and techniques to consider when selecting such a system (Harris-Vanderheiden, Brown, Mackenzie, Reinen and Scheibel, 1975): Idiosyncratic systems comprised of sounds and gestures particular to a child may be developed; manual signing may be implemented; symbol systems involving the use of representational symbols may be selected; picture boards, word boards or letter boards may be constructed; typing and handwriting skills may be utilized, or fingerspelling may be incorporated with manual signing.

Sophisticated computer mediated graphic or synthesized speech outputs are further options. The Ad Hoc Committee on Communication Processes and Non-Speaking Persons (1980) suggests that these systems can be divided into two basic categories: unaided systems,which require no external hardware but utilize manual, body and/or facial movement in order to express information; and aided systems, which require some physical medium in order to display symbols of various sorts. The unaided systems thus cover the manual communication systems - sign languages and systems, gestures and mime. The aided systems refer to the symbol systems, which are based upon static pictographic or abstract visual tokens and include Blissymbols, rebuses and words. The critical factors common to all these methods are that 1. the tokens used have referential value, 2. both communicants are familiar with them, and 3. there is a shared understanding of the rules that are to be used to form the communication (Sanders, 1976).

The above methods are typically used by teachers in conjunction with speech, an approach referred to as 'simultaneous communication'. As Tebbs (1978) points out, the fact that both speech and signs or symbols are available to the child means that the way is open for the child to develop expressive speech if this is at all possible. Thus the use of signs or symbols need not be considered as a deterrent to speech improvement, since improved oral skills (both in terms of comprehension and expression) can be encouraged in conjunction with the use of the nonspeech system. Moreover, research has revealed the possibility that the use of sign or symbol systems can actually facilitate speech development. As such, these methods may be seen as <u>augmenting</u> normal speech in communication, <u>or</u> as <u>alternatives</u> to speech where motor or other problems render the development of speech unlikely (Kiernan, 1977).

The individuals with whom augmentative and alternative communication systems are used include the language impaired and nonverbal or nonspeaking populations. The term 'nonverbal' as used here refers to those individuals for whom speech is not at present a functional means of meeting their communicative needs (Vanderheiden and Grilley, 1976). (A more precise definition was adopted in the present study to cover children with less than thirty intelligible spoken words). Thus the term does not mean that the child has no vocalization abilities, nor does it mean that the child may not develop full functional speech in the future. As such, augmentative and alternative communication systems can be used in a number of different ways (Yoder and Kraat, 1983). For some nonspeaking individuals these systems are augmentative. They are used to supplement insufficient production and reception skills, for example in cases where dysarthric speech is largely unintelligible, or to augment the understanding of spoken language. In other cases augmentative systems are utilized as a temporary means of communication to allow more conventional speech and language to emerge, for example in developing the beginnings of communication in autistic, severely mentally retarded or aphasic persons. With such individuals sign and symbol systems may serve as a bridge to speech expression and comprehension. For still other individuals these systems are alternative to speech, providing a lifelong means of communication where spoken communication does not become functional.

In the following two chapters the range of augmentative and alternative communication systems that are currently available for use will be reviewed.

Chapter 5. Manual Systems of Communication

Manual systems are those systems that involve the use of the hands, and also movements of the body and/or face, to convey the meanings of words and concepts. 'Gestures' and 'signs' are two types of manual symbols used in these systems. As defined by Reichle, Williams and Ryan (1981), signs are gestures that have been conventionalized and conform to certain rules or are constrained in their formation and usage, whereas gestures have no such linguistic constraints, but do have cultural interpretations. Manual systems available for use may be divided into categories based on the origin, type and intent of the systems, as follows: natural gestures and pantomime; the Amer-Ind Signal Code; natural sign language; educational sign systems which have been developed to represent spoken English; and gestural language codes, which serve to represent the letters or sounds of a language such as English.

5.1 Mime and Natural Gestures

Idiosyncratic gestures are the gestures which an individual himself has devised to indicate various needs or wants. They involve gross motor movements such as pointing, or movements that are topographically similar to the actions and objects they represent. Such gestures clearly have limitations with regard to the meanings that can be expressed because they are essentially limited to expressing objects and actions. Moreover, the individual's capability to use these systems is limited by his ability to devise ways of communicating with his environment, and by the ability of others to interpret the gestures. While many gestures are generally understood, the audience for an individual utilizing nonstandard gestures may be limited to people who know the child well (Nietupski and Hamre - Nietupski, 1977). Pantomime is based on the technique of conveying information or ideas using the musculature of the entire body. Mime has been used with children and adults, including cerebral palsied, mentally retarded and aphasic individuals. It does not require as high a level of functioning of the musculature of the upper extremities as do the sign languages and systems, it is more concrete than these systems, and is generally highly intelligible to untrained observers if done reasonably well (Silverman, 1980). But effective pantomime does depend on cognitive, experiential and physical factors in order to be understood.

Meldreth mime is a system comprising a limited series of gestures which were devised or selected as reflecting the form of their referents. It was developed by Levett (1969, 1971a, 1971b) at Meldreth Training School for use with severely subnormal multiply handicapped children. However, the 100 gesture vocabulary was rapidly mastered by a number of children and the system has since been superseded at the school by the Paget Gorman Sign System. Van Mierlo (1975) also devised a mime system for use with multiply handicapped children, which places minimal requirements on motor skill.

5.2 Amer-Ind Gestural Code

Amer-Ind is a gestural communication system originally developed by the American Indians for inter-tribal communication, and adapted by Skelly (1979) for use by glossectomees, and mentally handicapped, aphasic, dysarthric and dyspraxic individuals. Skelly describes the system not as a language but as a 'gestural code' or signal system; the gestures are seen as representing 'concepts' rather than translating to individual spoken words. Amer-Ind is different from most sign systems because it is not linguistically based. However, its signals are also different from natural gestures since it is codified (Musselwhite and St. Louis, 1982).

Each gesture or signal is said to be a vivid concrete representation of the dominant characteristic of the referent object, action or person (or combination of these), described by history, appearance or use to convey a message (Skelly, Schinsky, Smith et al., 1975). The system includes some 250 such gestures, but since each concept embraces several English words, Skelly argues that the repertoire has an English vocabulary equivalence of about 2500 words. The vocabulary can be further extended by the principal of agglutination - the combination of signals to transmit an increasing number of concepts. Amer-Ind has no structure requiring complex rules or grammar (Skelly, 1979). Its style is telegraphic, using the fewest possible signals for encoding messages, and the relation of one idea to another is indicated chiefly by proximity, sequence and context.

According to Skelly, Amer-Ind's low symbolic level, flexibility, speed, lack of grammatical structure and rules, and use of concrete, demonstrable referents, make the system easy to learn by nonspeaking individuals and easy to interpret, even by untrained viewers. On the basis of a series of studies, she claims over 80% intelligibility for the Code to people unfamiliar with the system (1979).

Lloyd and Daniloff (1983) have, however, pointed to some drawbacks to the application of Amer-Ind with mentally handicapped children. Since it was developed for adult surgical patients with normal cognitive abilities, some of the vocabulary is inappropriate for handicapped children, while other, relevant, items have been omitted or require agglutinations in order to form standard Amer-Ind signals. And, as Daniloff and Shafer (1981) have found, signal combinations are very difficult for the mentally handicapped to acquire. Another potential drawback of the Code is its lack of specificity. Each signal represents a very broad concept with numerous related concepts subsumed under it. While this gives Amer-Ind flexibility, Lloyd and Daniloff point out that it may cause difficulties for individuals who operate on very concrete cognitive levels.

5.3 Natural Sign Languages

A variety of natural sign languages have been evolved in everyday use by deaf communities in different parts of the world. Of these, American Sign Language (ASL) has received the most extensive linguistic examination, although British Sign Language (BSL) has also been increasingly studied in the last few years (e.g. Kyle and Woll, 1981, 1983). These sign systems are languages in their own right, independent of spoken English. Their signs do not translate directly into English words and their grammars do not mirror English syntax (Kiernan, 1982).

Many of the signs in sign languages are said to be iconic, a feature which is held to be in contrast with the form of words in spoken languages, where there is an arbitrary relation between word and meaning. Yet relatively few signs are so clearly transparent that their meaning could be guessed without additional cues. Bellugi and Klima (1976) found that only 10% of a group of 90 ASL signs presented in isolation were transparent to hearing non-signers. Kyle and Woll (1981) point out that historically signs have become less pantomimic over time, becoming more systematically related to each other and assuming more arbitrary shapes and positions. Moreover, even for iconic signs, signers may not necessarily know the source of iconicity. Kyle and Woll add that while sign languages may represent iconically items that can be described with a visual image, spoken languages may represent 'iconically' items that can be described with a sound image; and as more items can be represented with a picture than with a sound, the contrast between spoken and sign languages in this area may be one of degree, not of kind.

For a long time it was thought that sign language had no grammar of its own. Only in the last few years has it been recognized that sign languages do in fact have grammatical systems of morphology and syntax (Bellugi and Klima, 1984). The exploration of these grammatical and lexical processes is still in its infancy, but a substantial amount of information has already been accumulated in this area. As already stated, the grammar of sign language differs markedly from that of English. Grammatical modifications are not made by appended inflections but rather by changes in the internal structure, in the handshape, location, movement or orientation of signs (Grove, 1982). Thus, for example, grammatical subject and object relations are commonly incorporated into the verb by changing the direction of the movement of a sign, while plurality may be indicated by reduplication of signs. It is being increasingly realized that non-manual articulators, including facial expressions, mouth and body movements, also play an important role in the grammar of sign languages. In one type of negative modification, for example, the hands will form the sign while the head is shaken; Lawson (1983) further describes the use of the mouth pattern "sh" in BSL with signs whose meaning appears to be predicative.

The various modifications of the parameters of signs and the use of non-manual signals occur simultaneously with signs, thereby saving the time that would be necessary to add additional morphemes in spoken language. Thus Bellugi and Fischer (1972) point out with reference to ASL that while it takes longer to produce a sign than to articulate a spoken word, propositions take about the same amount of time to express in both mediums because sign language uses the above mechanisms of incorporation and concurrent non-manual signals to compensate for the extended time necessary to produce signs (Siple, 1978).

Turning to the question of word, or rather sign, order, Fischer (1975) argued that ASL is basically a subject-verb-object language, although other orders are allowed under certain circumstances. Other researchers, by contrast, claim that word order in ASL is relatively free (Wilbur, 1979). Deuchar (1984), however, argues that a topic-comment rather than a subject-verb-object analysis is more appropriate for BSL and ASL, claiming that the notions of subject, verb and object may not be viable for such languages, and that linear or temporal order is not the only significant dimension in the language. As already pointed out above, sign languages make use of the spatial as well as the temporal dimension and some aspects of grammar are coded simultaneously rather than sequentially.

Apart from the deaf community, ASL and BSL signs have been used with mentally retarded, autistic and dysarthric individuals. It is important to bear in mind that the most common method for teaching signs to non-deaf language impaired persons is simultaneous communication, which involves presenting signs and spoken words to the child at the same time. Most teachers thus use signs following English word order and do not use the syntax of the natural sign languages (Goodman, Wilson and Bornstein, 1978; Kiernan, Reid and Jones, 1982).

The Makaton Vocabulary:

The Makaton Vocabulary is a specially selected vocabulary of BSL signs developed for use with mentally handicapped children and adults. It was originally devised by Cornforth,Johnson and Walker in 1972 as an aid in teaching sign language to a group of deaf mentally handicapped adults living in a subnormality hospital (1974). In 1976 the Revised Makaton Vocabulary was introduced (Walker, 1978) to meet the needs of mentally handicapped children living in the community as well. It comprises approximately 350 signs presented in 8 stages, with a 9th stage of additional vocabulary. The vocabulary is said to be structured in stages of increasing complexity, with the initial stages comprising basic vocabulary necessary to express essential needs, and subsequent stages expanding on these and introducing more complex language concepts (Walker, 1980). The aim as stated by Walker is to ensure that if limited learning ability and poor retention prevent an individual from progressing beyond the initial stages, then he/she will at least have acquired a useful basic vocabulary for communication. Walker (1976) has developed language programmes containing guidelines for teaching the vocabulary and illustrating underlying concepts such as verbs, colour and size. She recommends that key words only are signed so that there is economy of memory loading for those with limited retention abilities. She stresses that signing should always be accompanied by normal grammatical speech and appropriate facial expression and that, when teaching the vocabulary, the stages should be followed in sequence (Walker and Armfield, 1981).

The teaching of signing within the Makaton Vocabulary has been widely adopted in special schools, units and hospitals in the U.K., where it is used with a wide range of language impaired populations, including mentally handicapped deaf and hearing children and adults who have little or no expressive speech and poor comprehension, individuals who are both physically and mentally handicapped, autistic children, some young deaf children of normal intelligence, children with severe articulation problems, and adults with acquired communication problems, for example following a stroke (Kiernan, Reid and Jones, 1982; Walker, 1978).

However, in recent years a number of writers have voiced concern about certain aspects of the Makaton Vocabulary and the guidelines that have been recommended for its use. In the first place Makaton is presented as a staged vocabulary which is graded in difficulty and incorporates a developmental sequence of language concepts. But Kiernan, Jordan and Saunders (1978) and Kiernan, Reid and Jones (1982) argue that the vocabulary has now been so modified that its empirical basis is unclear. They add that although the stages represent collections of signs which might usefully be taught together, there is no relation between 'difficulty' or 'frequency' of use of words and concepts and the stages of the vocabulary. Kiernan (1984) further points out that only 35% of Makaton items in the first two stages of the Vocabulary are relational (i.e. allowing for multiple meanings) and that there is an absence in the Vocabulary of clear coverage of several semantic categories; for example, it does not acknowledge the various categories of negation expressed in children's early utterances. The need to adhere to the stage structure of the Makaton Vocabulary (Walker, 1978) is also not supported by any empirical evidence. In fact, based on the results of a survey into the use of augmentative systems of communication in special schools and units in the U.K., Kiernan, Reid and Jones (1982) concluded that children in schools reporting flexible use of the Makaton stages progressed as well as children in schools where the stages were strictly adhered to. Kiernan (1983c) suggests that as there are to date no published data to support the value of the stage structure, a more child-centred approach to vocabulary selection may well be more beneficial. Walker's recommendation that only key words in spoken sentences should be signed (1976) is based on the assumption that the acquisition of sign understanding and use will be facilitated by signing key words only. This assumption too is not backed by empirical support and is thus open to debate.

A further criticism, raised by Kyle and Woll (1981), relates to the way in which both teachers and children are taught signing within the framework of the Makaton Vocabulary. They argue that to learn to use BSL, as in the Makaton Vocabulary, without knowledge or consideration of how it is used in the natural sign language form, may well produce communication that is 'hollow' in the language sense. Kyle and Woll stress that this can become extremely limiting in the case of more able children when individual signs are not known by teachers and their ignorance of 'grammar' in BSL means that they cannot get around the vocabulary problem. This issue relates directly to the problem of the fate of pupils who have successfully learnt all the Makaton signs but fail to move on to a reliance on speech. Walker and Buckfield (1983) say that such individuals can move on to a 'fuller signing and total communication programme', but they offer no elaboration on this recommendation. There are three options available to such individuals. They could be placed in a Paget Gorman Sign System programme (see below) where the form of signs is quite different from those in BSL; they could be taught more BSL signs within a Signed English framework, with special signs or fingerspelling being used to mark inflectional processes paralleling spoken English syntax; or they can switch away from using signs in English word order to learning BSL signs and syntax in natural sign language form. This major issue is yet to be resolved.

Despite the reservations that have been voiced about the Makaton Vocabulary, it is currently the most common sign 'system' in use with nonspeaking and severely language impaired children in the U.K. (Kiernan, Reid and Jones, 1982). As such it was selected as one of the two augmentative communication systems whose use by nonverbal cerebral palsied children was examined in the present investigation.

5.4 Contrived Sign Systems

As was emphasized in the previous section, the natural sign languages (ASL, BSL etc.) are independent of spoken English and their syntax differs from spoken English syntax. Many workers have argued that learning natural sign language would interfere with the acquisition of spoken English and, as a result, several systems have been developed that put signs into the framework of English syntactic structure, on the (as yet untested) assumption that signs used in English word order would make the transition from sign to spoken English easier (Wilbur, 1976). These systems include Paget Gorman Sign System (PGSS)(Paget and Gorman, 1968), Seeing Essential English (SEE 1) (Anthony, 1971), Signing Exact English (SEE 2) (Gustason and Zawolkow, 1980), Signed English (Bornstein, 1973) and Manual English (Stokoe, 1976).

The Paget Gorman Sign System, the first of the contrived systems, was devised in England by Richard Paget, with further development by Pierre Gorman and Grace Paget. It is not a separate language, since its grammatical structure is simply a method of expressing the structure of spoken language in signs in a one-to-one way (Craig, 1973). The signs differ in form from those of BSL, and an attempt has been made to group signs with a common concept around 'basic signs'; for example, all signs for animals involve a basic animal sign, with additional elements to identify the particular animal. Kiernan, Jones and Saunders (1978) point out that this grouping may be of considerable help to the mentally handicapped. It does, however, lead to difficulties when a word so treated has a number of very different meanings. Exponents of the PGSS argue for the use of speech simultaneously with signing. The system uses spoken English word order and includes functional signs allowing tenses to be signified, the possessive, and other affixes 'missing' from natural sign languages. The PGSS was initially devised to help deaf children, but it is currently being used in the U.K. also with language disordered, cerebral palsied, autistic and mentally retarded individuals (Tebbs, 1978). Rowe (1982) points out that while the system is often criticized as being too complex for certain groups, different levels may be used by individuals of different ranges of ability. Thus with severely mentally handicapped children it is possible to use only the root forms of the signs, and the system does allow for linguistic development.

In America, several systems have been developed from ASL which aim to complement it by including missing components and using spoken English word order. SEE 1 (Anthony, 1971), for example, borrows much of its basic vocabulary from ASL but alters semantic boundaries. Each sign represents a single word rather than a concept. New signs have been invented for synonymous words originally represented by a single sign. English pronouns and articles have sign equivalents, and devised signs are used for tense markers and other inflections. A second system, Signed English (Bornstein, 1973) was designed specifically for preschool children. This system borrows its vocabulary directly from ASL without alteration and uses signs in English word order, with or without the use of fingerspelling or selected grammatical inflections. For younger or less able children the system can be reduced to a few hundred signs with no sign markers (Bornstein and Hamilton, 1978). A pedagogic version of BSL has also been developed in the U.K., in which BSL signs are used in English word order, with additional signs to reflect such features as tense endings (Working Party on Signed English, 1984).

It remains to be seen whether such contrived systems do in fact foster correct English syntactical use in signing individuals. Fenn (1976) argues that this practice may well be misguided since it assumes that a simple parallel can be drawn between an auditory and a visual-manual mode of communication, and it ignores the possible implications of the differences between the two media. One such difference concerns the distortion of the 'natural' word order of sign languages in the contrived systems. It has been suggested in this regard that whereas in the more rapid medium of speech the memory span easily retains several associated units and their order is therefore less important, the clarity and interpretation of the slower medium of sign is assisted if the sentence topic is stated first and the supporting context is built up secondarily. Griffith (1980) reiterates that languages which have undergone historical change, such as ASL and English, are adapted to the human central processing mechanism, such that - in Wilbur's (1979) words - there is an optimal range of time in which linguistic processing occurs. As already noted, Bellugi and Fischer (1972) found that it takes longer to produce a sign than a spoken word, but that propositions take the same amount of time to transmit because ASL and BSL condense information by the mechanisms of incorporation and concurrent nonmanual signals to indicate grammatical modifications. In contrast, contrived systems include all these modifications, making the signed message of longer duration than its spoken counterpart. Visual overload may occur under these circumstances. On the other hand, Kiernan (1977) has pointed out that if the child is ever to learn to understand and use normal speech, the use of an augmentative system involving the same basic linguistic structure is important.

5.5 Gestural Language Codes

Fingerspelling and Cued Speech are separated from the other manual systems because their relationship with English and speech is different. Fingerspelling consists of 26 distinct handshapes that directly correspond to the 26 letters of the alphabet, and words are spelled out 'on the hand' through this manual alphabet. The use of fingerspelling requires good spelling ability and a much greater degree of manual motor coordination than does signing. Moreover, extensive practice is required to use the system fluently. In view of these considerations, its use with nonverbal populations other than the deaf is rare (Musselwhite and St. Louis, 1982).

Cued Speech is most appropriately viewed as an auxiliary to speech and not as a separate communication channel for language (Moores, 1969). The basis of the system, which was developed by Cornett (1967), is that speech sounds which are difficult for hearing impaired individuals to discriminate on the basis of visible lip and tongue movements are additionally cued by the speaker through hand cues. Kiernan, Reid and Jones (1982) found no record of the use of Cued Speech in special schools for physically handicapped, educationally subnormal or autistic children in the U.K.

Chapter 6. The Symbol Systems

There are a variety of symbol systems which can be used by nonverbal and severely language handicapped individuals, ranging from three-dimensional objects through pictures, line drawings, rebuses, Blissymbols and abstract symbols, to the use of traditional orthography. The systems are all based on static pictographic, ideographic or abstract visual tokens. The tokens/symbols themselves can be used in three types of modes: they may be drawn or written, they may consist of manipulable tokens, or they may be visually displayed on a variety of devices ranging from relatively simple non-mechanical devices to highly sophisticated electronic devices. The most widely used of such aids is the communication board, with which the individual uses some sort of pointing response to indicate his/her choice of various elements (pictures, symbols, words etc.) that are located on the board. Other systems such as machine-generated (recorded or synthesized) spoken language used with electronic communication devices, and the use of the Morse Code as an encoding symbol system for indicating and generating message components, are also available (e.g. Silverman, 1980) but a discussion of these is beyond the scope of the present work.

6.1 Models, Photographs, Pictures and Drawings

The elements of these systems all physically resemble actual objects or situations to a greater or lesser extent. In each case, then, the representation is pictographic and each element may be holophrastic in that it can represent more than one idea (for example, a picture of a cup can designate the entire class of 'things to drink') (Silverman, 1980). These four modes imply a progression in degree of abstraction (Shane, 1979).

Silverman defines a model as a miniature object that resembles an actual object. The use of such tangible objects as a communication system has the advantage of providing direct representation for initial attempts at communication by individuals who are at the time unable to deal with more representational levels. Models thus provide a straightforward and unambiguous means of communicating about aspects of the immediate environment. They are, however, cumbersome for programming purposes and obviously limit the individual to the expression of concepts which are representable through objects.

Photographs, pictures and line drawings are more accessible than tangible objects and can be placed on portable communication boards.

Typically, the individual sequentially points to pictures that represent objects or ideas to be communicated. They are generally intelligible to an untrained audience, although the message receiver is required to make use of contextual clues in order to interpret the message, which could lead to confusion and ambiguities. Moreover, pictures and drawings are typically better suited for encoding concrete concepts rather than abstract, and messages about the here-and-now rather than the past or future. These modes are thus limited in their versatility (Vanderheiden and Harris-Vanderheiden, 1976). They are, however, among the easiest systems to implement with very young or severely mentally handicapped children, and, in that they involve a greater degree of abstraction than do concrete objects, they can provide a useful intermediate step between the use of tangible objects and more abstract representational modes such as Blissymbolics.

6.2 Formalized Pictorial Systems and Rebuses

The term 'rebus' has been used in two ways. In the first place it can refer to pictorial symbols. However, Kiernan (1982) points out that the use of the term in this way is misleading and that it is more correctly applied to pictures whose names sound like the names of the objects that one wishes to represent. Thus, for example, in the Peabody Rebus System, a picture of a bee is used as the rebus for the verb 'be'. The Peabody Rebuses (Clark, Davies and Woodcock, 1974) were designed as an introduction to reading for normal preschool and retarded children. The system involves a set of symbols, some pictorial and others more abstract, which have a strong phonological base. To take another example, a pictorial symbol for 'eat' could be combined with the letter 'h' to represent the symbol for 'heat' (Kiernan, Reid and Jones, 1982). The Rebus system allows for representation of the past, present and future tenses, and inflectional distinctions can be indicated by adding an appropriate English suffix to a rebus, for example adding 's' to a rebus to indicate the plural. The syntax for Rebus can therefore parallel English. An example of the use of Peabody Rebus symbols to construct an English sentence is presented in Appendix 1.

In providing communication techniques, rebuses have been used as symbols on communication boards. As many rebuses are pictographic, they should be intelligible to untrained observers, and English word equivalents can also be printed below them to make them intelligible to anyone who can read. However, as Kiernan (1983c) points out, the Peabody Rebus format has generally been felt to be too phonic for use with mentally handicapped and other severely language impaired populations. Consequently, a number of systems have been developed consisting of standardized picto- and ideograms which are not phonetically based.

One such system is Picsyms, a system of picture symbols that was designed by Carlson (1982) for use with nonspeakers who are unable to read or use more abstract symbols. Leeming, Swann et al.(1979) point out that Picsyms grew out of an attempt to develop a formal drawing system for teachers who could not draw well. In the system,concrete concepts are represented iconically while abstract concepts are represented with varying degrees of abstractness. A single word can be represented by several Picsyms if it has several meanings. Each word category has a symbol configuration to designate it; for example, an arrow indicates action, and the arrow is bent around a symbol to differentiate tenses. There are developmental or maturational variations included in the system, and Carlson suggests that as children begin to recognise letters and words, Picsyms (like the Peabody Rebuses) may be combined with traditional orthography to encourage the move towards reading. Thus plurals, for example, are represented at one level by multiple symbols of the item, but at another level by a tag attached to the primary symbol containing the letters '-s' or '-es'. This was done so that at the upper limits of the system the symbols can be phased out and replaced by printed words. An example of a message constructed in Picsyms is presented in Appendix 1.

In a number of systems standardized pictographs have been developed which are directly linked with manual signs. Such symbol systems can be used concurrently with signs and speech, aiming to provide one vocabulary but three possible modes of communication (Grove, 1980). Cregan (1982) has developed Sigsymbols, a system which employs simple outline drawings or pictographs to stand for whole words, but which also reflects, where possible, the form of BSL signs in symbols. Cregan suggests that the symbols, BSL signs and speech can thus be taught together so that non-representational symbols maintain a concrete link with the child's motor experience. The symbols can then act as a stable cue to assist the elicitation of signed or spoken language. A similar scheme has been developed by workers on the Makaton Vocabulary Development Project (1985) for use with severely physically and mentally handicapped individuals who have difficulty in producing intelligible speech or precise signs (see Appendix 1 for examples of Makaton symbols). The system can be used together with the Makaton Vocabulary BSL signs and speech.

Orcutt (1984) has developed yet another system which can be manually signed or used as a graphic system. Called Worldsign, it is described as a 'kinetic language' and the graphic symbols have elements of bodily motion or gestures incorporated in them.

6.3 Blissymbolics

Blissymbolics was developed by Charles Bliss (1965) with the intention of providing a universal communication system. It was first applied as an augmentative aid to speech in 1971, when it was introduced to physically handicapped, nonspeaking children at the Ontario Crippled Children's Centre in Toronto (McNaughton, 1976b; McNaughton and Kates, 1980). It was subsequently introduced into a few schools in the U.K. in 1974 (Hammond and Bailey, 1976). The Blissymbol approach was intended for children who are capable of using more advanced software than picture boards offer, but who are not ready developmentally to begin using the printed word for expressive communication. It was thus seen as fulfilling a programming gap that existed between picture and word board communication procedures (Shane, 1979). Since the early 1970s the system has grown in popularity and it is currently being used with a range of language and speech impaired individuals, including physically handicapped, mentally handicapped,multiply handicapped, deaf and aphasic children and adults, as well as individuals with acquired language impairment (Bailey and Hammond, 1978; Silverman, 1980). Kiernan, Reid and Jones (1982), in their surveys of the use of augmentative communication systems in special schools and units in the U.K., found Bliss to be the most common of the symbol systems utilized. It is especially prevalent in schools for physically handicapped children. In view of this, it was selected as one of the two augmentative systems whose use by nonverbal cerebral palsied children was examined in the present investigation.

Blissymbolics is a semantically based system. Most of its components relate directly or indirectly to meaning, though for a few configurations meaning has been assigned arbitrarily. The symbols are thus of several types: pictographs, or drawings that resemble what they are intended to symbolize (e.g.  for HOUSE); ideographs, or drawings that symbolize the idea of a thing rather than the name of it (e.g.  to represent the abstract concept of FEELING); and arbitrary symbols, which have no pictorial relationship between the form and what they are intended to symbolize (e.g.  to represent the concept of NAME). There are also mixed symbols which consist of pictographic, ideographic and/or arbitrary components organized in different combinations. Each symbol may signify a number of related meanings; thus, for example, the symbol  can represent I or ME depending on the order in which it is indicated within a sequence of symbols. Similarly, the symbol for HOUSE may be interpreted as HOUSE or BUILDING according to the context in which the symbol is used.

There are two basic methods for extending the meanings of symbols, and thereby enlarging the available vocabulary. A given Blissymbol can function as the English equivalent of a noun, verb, adverb or adjective, and the first method involves the use of indicators with appropriate symbols to specify grammatical classes and morphological changes. For example, an action indicator used above a symbol gives it a verb meaning. There are also indicators to specify the plural, and past and future tenses. The negative and possessive, on the other hand, are represented by a single symbol each. The second method involves the use of a number of strategies to change symbol meanings and thus to expand the symbol vocabulary that is available to the individual. These strategies are indicated by special symbols. For example, the symbol for OPPOSITE MEANING signals the intended expression of a thought antithetical to a given symbol; the symbol for SIMILAR SOUND indicates an English word that is pronounced like the symbol indicated but has a different meaning. New symbols may also be created by combining existing symbols to form compound symbols. The meaning of such symbols can be inferred from the meanings of their elements plus the context.

As has been pointed out by Kiernan, Reid and Jones (1982), unlike the Makaton Vocabulary approach to BSL, proponents of Blissymbolics emphasize the need for user-based vocabularies. Typically the Bliss user will have an individualized vocabulary of symbols fixed on a chart and he/she will indicate the symbols required in sequence.

There are three different "grammars" which are associated with the use of Blissymbols (Hunnicutt, 1984). The first is the so-called telegraphic style. It is the easiest, shortest style of Bliss communication, omitting function words and inflections and paying less attention to word order. Since it allows for speedy communication it is sometimes recommended for conversational exchanges. Charles Bliss himself developed a simple syntax for Blissymbol use, in which function words are omitted and in which some of the structural forms employ word orders that are different from those used in English (Bliss, 1965; McDonald, 1980b). For example, place, followed by time, is indicated at the beginning of a sentence, followed in turn by the remainder of the sentence. In simple sentences, a Subject-Verb-Object order is recommended. In negative statements, the symbol for the negative is placed before the verb. For question forms the QUESTION symbol, or another question word, is placed at the beginning of a question, and the symbol order following this is the same as in statements. Examples of utterances formed in Bliss syntax are presented in Appendix 1. Typically, however, English word order is used in teaching Bliss, though with some modifications (e.g. question and negative utterances), and the use of symbols representing not only content but also function words is encouraged.

The linguistic structure of Blissymbolics can thus be made compatible with that of English. Further, as has been shown above, while the morphological structure of Blissymbolics differs from that of English, morphological variations in English have Bliss equivalents. The Blissymbol system can thus generate the various grammatical structures such as verb tense, plural, possessive, question and negative, while its semantic base allows a small number of symbols to be combined into a large number of entries (Musselwhite and St. Louis, 1982). Proponents of the system point to these factors as evidence of their claim that Bliss offers a complete language capability that can be utilized according to the user's ability.

The system has other advantages as well. It contains many concepts and abstractions that could not, for example, be easily depicted with purely pictoral systems. The written counterpart of the Blissymbol always appears with the symbol, so that even those unfamiliar with the system can communicate with Bliss users provided that they can read. The system is thus not 'closed' as are some signing systems. In addition, McNaughton (1976a) and Harris-Vanderheiden, Brown, MacKenzie, Reinen and Scheibel (1975) claim, on the basis of experience, that the symbols are easier to learn and remember than are words, and they suggest that this is due in part to the many cues to meaning that can be seen in the symbols. Blissymbols can therefore serve as a communication mode for the child who cannot read or spell, as a transition symbol system for the prereading child who will eventually learn traditional orthography, or as a convenient conversational communication system for the individual who can already use traditional orthography (Vanderheiden and Harris-Vanderheiden, 1976). Moreover, since the Blissymbols can be reproduced, students can receive a 'hard copy' of their expressive output, which is extremely useful in teaching situations (Carlson, 1982). On the other hand, it must be borne in mind that the Bliss users' communication attempts are always limited by the symbols or symbol combinations they have on their charts (bearing in mind the use that can be made of strategies, where these are available), and that since the syntax produced with the system may differ from English structure in various ways and telegraphic utterances may be used, message receivers could have difficulty with the interpretation of Bliss utterances. Visual perceptual problems and the abstraction level of the Blissymbols themselves could also hinder their effective use by some individuals.

6.4 Abstract Symbol Systems

In abstract symbol systems the form of the symbols typically bears no relation to the objects or actions which they represent. Premack (1970, 1971) devised a set of abstract plastic symbols that arbitrarily represented verbal symbols, and investigated the ability of a chimpanzee to learn certain dimensions of human language through the manipulation of these symbols. The plastic chips that were used varied in colour, shape and size and were metal-backed so that they could be arranged vertically on a magnetic board in specific sequences, thus forming 'sentences'. The syntactical rules for sequencing the symbols were adopted from English. The chimpanzee was trained to place the plastic symbols in sequential order to form sentences and by the end of training she was capable of producing and comprehending a variety of simple sentences, as well as a compound and a complex sentence, utilizing the chips.

Following on Premack's research, Carrier and Peak (1975) and Carrier (1976) devised the Non-Speech Language Initiation Program (Non-SLIP) for severely mentally handicapped language impaired children, also using movable abstract plastic symbols to represent words. Again, each symbol was unique in shape and was colour-coded as to its syntactic class. Appendix 1 shows an example of the use of Non-Slip symbols to construct a sentence. Carrier designed a finely graded series of steps for training, in which the child is first taught to recognize and discriminate among the different symbols, and then to match symbols to construct sentences in a rote fashion. The various steps of the programme then train the child to select appropriate symbols, to sequence them according to grammatical rules, and to use the available symbols and rules to generate new responses. By the end of the programme the aim is for children to generate new appropriate sentences or combinations of up to seven symbols, of the form: article + noun + verb auxiliary + verb + preposition + article + noun.

In most of the studies in which adaptations of Premack's 'plastic language' have been used, they have not been taught to provide a symbol system for communication, but rather to provide tactics for learning language; that is, to teach a set of conceptual skills necessary to the acquisition of functional linguistic communication. The assumption is made that learning the symbol system will facilitate the acquisition of other symbol systems such as speech (Silverman, 1980). In Non-SLIP, speech accompanies the symbol training, and, from the stage of preposition training, speech becomes the central focus of the programme (Carrier and Peak, 1975).

Silverman (1980) points to several advantages of Premack-type symbols. They can be identified either by sight or by touch, making them potentially useable by visually-impaired individuals. They place minimal demands on memory - the symbol user does not have to remember the portion of a message that has already been coded because it is visible on a display. They may be easier to learn and remember than other symbols, since they may be recalled through vision and touch. And finally, since symbols are arbitrarily assigned to represent various concepts, additional symbols may be spontaneously created and added to the system. However, Musselwhite and St. Louis (1982) point out that the abstract nature of the symbols, the difficulty of keeping numerous bulky symbols within reach, and the necessity to manipulate the symbols, may make the system cumbersome and even unuseable as a communication system for many handicapped individuals. Moreover, the symbols would only be intelligible to untrained observers if English word equivalents were printed on them. However, the major problem with using the Non-SLIP programme as an augmentative communication system is that the authors fail to demonstrate that the skills therein acquired can be generalised and consist of anything more than a simple set of behaviours learned in a non-communicative setting and without functional utility (Kiernan, 1984).

6.5 Traditional Orthography

Traditional orthography lies at the end of the continuum of symbol systems (Kiernan, 1982). It is the least ambiguous and most flexible of the symbol systems, and has the added advantage of being a normative system and having a large audience of users. The use of traditional orthography as an augmentative communication system can be implemented in two ways (Vanderheiden and Harris-Vanderheiden, 1976). First, words themselves can be placed on the communication aid (communication chart, computer etc.). However, the number of words made available to the user will necessarily be limited by space considerations, thus severely limiting the individual's expressive power. Alternatively, the letters of the alphabet may be placed on the communication aid. In this way the individual's vocabulary potential is unbounded; but speed of transmission is slower because the user needs to indicate each letter of a word rather than one symbol representing a word. Recent developments in the use of computers (for example, in terms of methods of accessing the computer and the use of word or symbol stores) are, however, helping to mitigate some of the difficulties relating to storage space and rate of transmission. More crucially, the use of traditional orthography poses advanced cognitive requirements in that it requires adequate reading and/or spelling skills before it can be used.

6.6 Methods of Accessing the Symbol Communication Systems

Augmentative communication devices with which the above symbol systems may be used range from simple communication charts to highly sophisticated electronic devices, including portable independent communications aids with calculator-type displays, built-in strip printers, television displays, and typewriter controllers (Harris-Vanderheiden and Vanderheiden, 1980). A variety of communication aids can also be used as input modes to computers. In addition to the various aids with printed output, there are currently a few aids with synthesized voice for their output, although these still require considerable refinement as regards voice quality and inflection. Harris and Vanderheiden point out that the availability of printed output for systems such as traditional orthography and Blissymbols becomes particularly important when the symbol user is placed in an educational setting, because it means that he/she will be able to complete independent work without requiring the constant attention of a second person to help assemble and monitor a message.

To date, the most widely used augmentative communication device remains the communication board, whose content may consist of pictures, symbols, words, letters of the alphabet, or any combination of these. The content and design of the communication board is usually individualized for each user because the choice of symbol elements, their arrangement on the board, and factors such as positioning of the individual and the board, are highly dependent on the individual's intellectual level, educational level and physical capabilities. Not only must communication boards be individually created, but they must also undergo continual modification as the child's language develops and his needs to communicate expand. Many communication charts are designed around some system for teaching language structure. An adaptation of the Fitzgerald Key is often used (Fitzgerald, 1949) in which the symbols are placed in columns according to their grammatical form, thereby providing a visual pattern for correct English word order (McDonald, 1980 b).

A basic step in developing communication board use is the selection or development of a mechanism to provide the child with a means of indicating the elements of his message to an observer. Selection of content may be made directly by use of a finger-or fist-pointing response. Where the symbol user has inadequate control for accurate manual pointing but good trunk and head control, a head-pointer or mouthstick may be used. Other severely involved individuals may have to rely on eye-pointing as their sole means of direct indication, or utilize 'indirect' accessing techniques such as mechanically controlled rotating pointers or matrix systems, using switches adapted for their particular needs. Each technique has advantages and disadvantages, and is more applicable to some types of disability than to others. The amount of material that can be displayed on a communication board will be restricted by the individual's effective range of pointing movements or by the degree of refined movement and speed with which a pointing device can be controlled. In general, the greater the number and complexity of a child's controlled movements, the faster his speed of communication can be. However, as Vanderheiden and Harris-Vanderheiden (1976) point out, to achieve optimal speed and efficiency of communication a child must be matched with the technique that best utilizes his particular type and degree of control.

Although there are many different techniques for providing an individual with a means for indicating message elements, these techniques are all essentially variations or combinations of three basic approaches, namely scanning, encoding and direct selection (Vanderheiden and Harris-Vanderheiden, 1976). In scanning techniques the message elements are presented to the individual in a sequential manner and the individual specifies his choice by responding to the person or display presenting the elements. In the simplest form of scanning, the observer would point to the individual cells in a matrix one after the other and ask for each one whether it contains the message component the person wishes to transmit. The scanning approach is particularly powerful because all it requires is that the individual have some signal that can be detected by a second person or by an aid. It can thus be used by anyone no matter how severe his/her physical handicap. The major disadvantage of this approach is its relatively slow speed since typically many unwanted positions must be stepped over before the desired message element is reached.

Encoding techniques are techniques in which the desired message element is indicated by a pattern or code of input signals, where the pattern or code must be memorized or referred to on a chart. An example of such an encoding system is a matrix on to which symbols are placed and then chosen by a two coordinate selection which identifies the location of the intended symbols. Encoding techniques provide a faster means of communication than does scanning, and they permit access to relatively large symbol vocabularies with limited movement. However, they require greater physical control than the scanning aids, and higher cognitive abilities than either scanning or direct selection, since the encoding scheme must be learned.

In direct selection techniques the individual directly indicates the message elements, for example by directly pointing to symbols on the communication board. This approach is the quickest and most straight-forward way of indicating a symbol on a display, but its major limitation is that it requires a greater range of movement on the part of the individual (Vanderheiden and Harris-Vanderheiden, 1976). Combinations of these three approaches can of course be used to take advantage of the assets of each one in providing the best means of indication for a particular individual.

Chapter 7. Factors to Consider When Choosing and Implementing an Augmentative Communication System

The increasing use of augmentative communication systems has generated a number of issues which require careful consideration. These include the questions of whether and when to introduce the augmentative procedures for a given individual, and which augmentative system should be taught. A number of writers have provided guidelines on these questions (e.g. Alpert, 1980; Nietupski and Hamre-Nietupski, 1979), and these will be examined in the present chapter. The research that has been conducted to date bearing upon these issues will be fully explored in Part III.

7.1 When to Introduce Augmentative Procedures

One of the problems involved in initiating alternative and augmentative forms of communication is in being able to identify, at an early age, those children who have limited speech potential and who are thus most likely to benefit from training in nonverbal systems, thereby avoiding a prolonged period of frustration spent in fruitless attempts to train purely verbal skills. At the present time adequate information is lacking on the criteria to help with effective decision making within the high risk groups. Clearly an augmentative communication programme should be initiated for an individual with severe speech mechanism impairment which appears to preclude the development of adequate vocal responses. For individuals with no apparent speech mechanism impairment, factors involved in the decision might include age, the degree of verbal communication and past performance in speech therapy. It is however not uncommon to delay the introduction of an augmentative system for many years to see if speech will develop. As Yoder and Kraat (1983) point out, oral speech efforts and resistance to the implementation of nonverbal systems often create situations in which a system is first introduced only at the age of 8 or 9 years or even later. Indeed, in many of the research studies the rationale cited for introducing an augmentative system is that the children have extremely limited functional speech and have experienced repeated failure in verbal communication programmes (Nietupski and Hamre-Nietupski, 1977; Salisbury, Wambold and Watter, 1978). In the intervening years, however, immature and limiting communication patterns may become established, and frustration in the communication situation for the child, family and teachers will increase. Early language learning is critical for the normal acquisition of communication and of other developmental skills, and the implementation of augmentative communication systems at as early an age as possible is thus crucial. This position is further supported by the fact that introducing an augmentative system does not mean abandonment of oral speech goals, and by the findings, to be discussed in Part III, that these systems will not deter speech development, and may well enhance it.

Several writers have suggested certain cognitive prerequisites for acquiring nonverbal communication skills. Owens and House (1984) suggest that from a Piagetian viewpoint, one would look for the development of means-ends relationships, motor imitation, object permanence, causality, functional use and symbolic play skills. Single word speech reportedly begins in Piaget's late Stage IV or early Stage V, so a child not functioning at this level may not have the necessary cognitive abilities to functionally use single signs or symbols. Harris-Vanderheiden (1976) argues that object permanence skills are needed for Blissymbol use, while Chapman and Miller (1980) and Shane and Bashir (1980) state that to use augmentative systems, children must have acquired the skills delineated in Stages V and VI of Piaget's sensorimotor period, or else be taught such skills prior to entry into a nonverbal communication programme. Several infant development scales agree that children must attain a cognitive level of about 18 months before they are capable of associating referents with pictorial representations (e.g. Bayley, 1969).

Further research is however needed to validate the developmental approach and to identify valid instructional prerequisites (Nietupski and Hamre-Nietupski, 1977). Chapman and Miller (1980) note that as things stand at present, we have no answer to the basic question of whether augmentative systems require representational skills in order to be learned, or whether they are themselves a means of teaching representational skills. Guess, Sailor and Baer (1977) are among those who question the notion that cognitive-developmental level should determine readiness for augmentative communication training. As an alternative, they advocate a 'remedial' approach to training, which involves attempts to teach the individual the functional language skills necessary to communicate effectively without waiting for student "readiness".

7.2 User Characteristics Influencing Sign/symbol System Selection and Use

It is widely agreed that the process of selecting the augmentative communication system for which the child is likely to show the most potential for learning must be based upon consideration of two groups of variables, the first relating to the unique needs and abilities of the individual, and the second relating to the strengths and weaknesses characteristic of the particular augmentative systems. User characteristics are the first to be examined.

Level of cognitive functioning is one of the most important factors influencing the selection and use of a nonspeech communication system. Clearly, the higher the intellectual abilities the greater is likely to be the impact of any augmentative system. On the other hand, as Silverman (1980) points out, a disturbance in cognitive functioning can make it difficult or impossible for the individual to use relatively abstract symbols, and it can influence the size of the symbol set the person can manage and the complexity of its syntax. The individual would be likely to experience far more difficulty using traditional orthography, for example, than pictures or photographs. It has already been stated above that a number of writers (e.g. Chapman and Miller, 1980; Yoder and Calculator, 1981) see the comprehension and use of symbols as appropriate goals only when the individual demonstrates cognitive functioning which is characteristic of Piaget's sensorimotor Stage V. More specifically, all systems require the ability to associate signs or symbols with their meaning by some direct object or action referent or more abstract concepts, and the ability to comprehend that a visual symbolic representation can serve as a communicative signal. Considering the processing demands in sign or symbol use, Wilbur (1980) further notes that aside from the visual discrimination processing and the recognition memory required, the systems require short term memory ability to store messages until they can be processed. Other cognitive and developmental skills that are considered relevant include the ability to perform imitative matching with objects, gestures and symbols, attending skills and, at a more basic level, the ability to establish and maintain eye contact (e.g. Alpert, 1980). However, these skills need not be viewed as prerequisites for use of a communication system, since they can be trained either prior to or concurrently with many initial nonverbal communication skills (Hamre-Nietupski, Stroll, Holtz et al., 1977). Indeed, training in sign/symbol-referent associations may facilitate a higher level of cognitive functioning and, in turn, more advanced linguistic expressions.

Consideration of the child's current receptive and expressive language status will also influence the choice of a communication system and the complexity of the language material which is to be included. The child with extensive language comprehension skills, for example, will require a system that allows for their expression. Furthermore, almost all functionally nonverbal persons can communicate in at least a limited way, and information about how they do communicate may suggest systems that it would be possible for them to use (Silverman, 1980). For those individuals who use gestures spontaneously, such communicative forms may well represent a factor favouring the adoption of a manual communication system. Other individuals may be more 'picture oriented' and hence respond more favourably to symbol systems.

The potential user's motor status is one of the primary determiners of the communication systems he/she can use. If the musculature of the upper extremities functions normally, a highly flexible manual system such as BSL can be considered. Individuals with severe neuromotor deficits involving the upper extremeties are less likely candidates for a signing system. For such individuals a communication board may be more appropriate; but even here the degree of physical handicap is likely to dictate the type of symbol display and number of symbols which can be accessed. Mobility of the child is also relevant. The needs of the mobile child are best met with a manual system or an easily accessible and portable symbol chart. Further, the degree of intactness of a person's auditory, visual and tactile-kinesthetic-proprioceptive systems will play an important role in determining the augmentative systems that can be used (Silverman, 1980). Good visual skills are particularly important in using symbol communication systems. Visual acuity and discrimination skills are needed to identify message elements, and visual memory and tracking play an important role in scanning and direct selection techniques to recall or find the position of symbols on the communication chart. Visual acuity will also determine the number, size and placement of symbols on a display. As many signs, and especially gross gestures, are likely to make fewer demands on fine visual discrimination skills than do symbol systems such as Bliss, they may be better suited for individuals with poor visual ability. Furthermore, although some degree of vision would be necessary to 'receive' signs and gestures, it is not essential when sending a message (Dale, 1977). On the other hand, disturbances in a person's use of tactile, kinesthetic or proprioceptive sensation could have a detrimental effect on the ability to produce muscle gestures needed for manual signing.

Desire or motivation to communicate is another important determiner of successful use of augmentative communication systems. Lack of motivation for communication can arise from several sources, for example where all the individual's needs are anticipated by others, where there is little or no opportunity to communicate and limited opportunity for interpersonal relationships, or where past attempts at being understood have met with constant failure. As McDonald (1980a) points out, many multihandicapped children develop as passive, dependent individuals, never having the satisfaction of manipulating their environment. If they are ever to want to communicate, they need to be provided with opportunities for language expression, so that they can come to understand the value of communication.

A final and related factor to consider in communication system selection and use is the willingness of other persons in the child's environment to utilize an augmentative system with the child. In the words of Ferrier and Shane (1983), the motivation to put any communication system to use stems from its functional application with significant and caring others, with whom the desire to communicate has its origins. Maximal success in system use thus seems possible only with the cooperation and interest of significant others. Parents or staff may be unwilling to spend the time necessary to receive messages from a child using an augmentative system, or they may be reluctant to accept the use of such a system, believing that it represents giving up on verbal language training. Persuading them of the value of augmentative communication and gaining their motivation to use it with the child are of crucial importance.

7.3 System Characteristics Influencing Sign/Symbol System Selection and Use

As well as considering the needs and abilities of the potential user, factors indicating the advantages and disadvantages of the various augmentative methods themselves must be weighed prior to system selection. Questions here concern the decision on whether to select a sign or a symbol system, and which option to select within each of these two categories.

The relative advantages and disadvantages of sign and symbol systems in general are presented in Table 1. As can be seen, symbol systems have certain distinct advantages over manual systems. In the first place, the minimal motor skills required make them particularly useful for severely handicapped individuals. The motor response that has to be learnt is very simple since it only involves indicating particular symbols by pointing or through the use of mechanical aids. In contrast, the complex motor patterns that need to be learned and executed to use signs may preclude their use by individuals who are severely involved motorically. A second advantage of symbol systems, pinpointed by Kiernan (1983a) and others, is that they place different and possibly significantly fewer cognitive demands on the user than do manual systems. The static nature of symbols, as opposed to the transient nature of signs, allows additional scanning time which is likely to be valuable for learning. In addition, to use symbols the individual needs to be able to associate meaning with a visuo-spatial pattern, and then to recognize the symbol and indicate it. This side-steps any requirement of recall since the symbols are continuously present. Sign systems, on the other hand, require the user to be able to discriminate, imitate, learn <u>and</u> recall a variety of signs. Recognition is clearly a much simpler

<u>Table 1: General Characteristics of Symbol and Manual Systems of Communication</u>

	<u>Symbol Systems</u>	<u>Sign Systems</u>
Motor skill requirements	Minimal	Extensive
Cognitive requirements	Recognition of static symbols	Recall <u>and</u> execution of transient signs
Constant visual display	Permanent - printed output	Transient - no permanent record
Audience training	Minimal	Extensive - restricted audience
Portability	Cumbersome	Portable
Eye contact	Inhibits eye contact	Promotes face-to-face interaction

information processing task than recall. Kiernan, Reid and Jones (1982) add that similar considerations apply in the transition from single item utterances to the production of multi-item utterances. This is likely to be easier for symbol users since the symbols can serve as an external reference system through which utterances can be 'planned'. Moreover, symbols can be positioned on a communication board in a manner that will facilitate use of a desired order of selection (e.g. according to English word order), while there are no similar overt cues to aid in sign recall (Bristow and Fristoe, 1984).

Symbol systems have other advantages as well. The 'permanence' of symbols allows messages to be recorded and printed, thereby creating a permanent record which can be read by the message receiver at a later time. No such options are available within the various sign systems. Furthermore, the audience in the case of sign users is restricted to those individuals who have learnt the signs, and there are many cases where even parents or teachers are (for various reasons) reluctant to learn the system. By contrast, communication boards usually have the meanings of the individual symbols printed below them, thereby eliminating the need for special training of message receivers, provided that they can read.

Despite the drawbacks listed above, manual communication systems have their own major advantages over symbol systems. As noted by Hopper and Helmick (1977), sign languages are fluid and flexible, and they more closely approximate the spontaneous nature of spoken language than do the symbol systems. The tools necessary for using signs are part of the individual's body. Thus the 'equipment' for signing is completely portable, contrasting sharply with the often bulky devices required for symbol systems, which can be inconvenient to use in certain locations (e.g. in bed or in the swimming pool) and which are particularly cumbersome for the active, mobile child to carry around. Signing therefore permits spontaneity, and its use need not be limited to preplanned sessions, as is often the case with symbol systems (Fouts, Couch and O'Neil, 1979). Fouts et al. make the important point that sign language further affords the total spontaneity that is necessary for private 'babbling', a stage which normal speakers go through in language acquisition. In addition, while the vocabulary of symbol systems is limited by trainers to a particular number of items, a sign user can invent idiosyncratic signs for needed vocabulary, and pick up signs used by others that may not have been directly taught. Another important advantage of signing is the direct emotional and personal involvement of the signer. Emotions can be expressed through facial expression and body movements, whereas in symbol systems emotional overtones are typically expressed by adding extra symbols, thereby diluting the immedicay of the communication of feeling. Finally, the use of signs requires the child to attend to the teacher/interactant in order to see the signs, which is likely to enhance face-to-face interaction. In contrast, the use of a communication chart requires concentration on the chart, which reduces eye contact and makes it difficult to interact in a group setting.

Reviewing the above considerations, Nietupski and Hamre-Nietupski (1979) suggest, as very broad guidelines, that a manual system may be considered appropriate if an individual 1. can control the movements of the upper extremities, 2. exhibits attending skills, motor imitation and/or the performance of actions when provided with gestural prompts, and 3. has access to an audience that uses or is willing to learn signs. A symbol system may be considered if the individual 1. has physical impairments which preclude the control of hand and finger movements, 2. tends not to attend to the actions of others but prefers to interact with objects, and 3. has access to an audience that is not willing to learn a manual system. However, as already suggested, the picture is far more complicated than these simple guidelines would suggest; and there are a multitude of additional factors that need to be evaluated.

Once a sign or symbol means is decided, decisions must be made regarding the most appropriate system to select within that category. Sign and symbol systems vary in their complexity. Thus when selecting between existing systems, factors to consider include cognitive and linguistic abilities required for acquisition, neuromotor skill requirements, scope of language afforded by the system, its degree of correspondence to spoken English, intelligibility to untrained individuals, speed of transmission, degree of independence afforded the user, and acceptability of the system to the user, family, peers and others (Goodenough-Trepagnier, 1981; Lloyd and Karlan, 1984; Nietupski and Hamre-Nietupski, 1979).

Symbols and signs having feature similarity to their referents (iconic) are usually thought of as the easiest to acquire and so more appropriate for the younger and less able child. Such systems (mime, naturalistic gestures and pictorial systems) may also allow for greater interaction between the system user and untrained viewers, who can usually readily discern their meaning with little or no training. On the other hand, these systems encompass a relatively limited range of communicative content and are inadequate for expressing any but the simplest needs and ideas. Sign and symbol systems that are more abstract or arbitrary, and more closely approximate natural languages, make greater cognitive and linguistic demands, but yield greater representational range within the system and a greater capacity to express a wide variety of meanings. These systems include the sign systems and languages (BSL, ASL, the PGSS etc.), and symbol systems such as Bliss which, being semantically based rather than object based, is also able to evoke generalizations and abstractions. While Amer-Ind is not as flexible a system as ASL, it is said to be more concrete and hence easier to learn, but also capable of allowing for the expression of a wider range of meanings than mime or idiosyncratic gestures (Skelly, 1979).

At the end of the continuum of augmentative systems lies traditional orthography. The use of traditional orthography in word or letter boards, and the use of fingerspelling, constitute the most flexible and least ambiguous of the sign and symbol systems and allow for a potentially unbounded vocabulary. Traditional orthography has the further advantage of being a normative system and having a large audience of users, and it will consequently be the most acceptable to parents and teachers. However, these systems pose advanced cognitive requirements on the user in the form of reading and/or spelling skills and are thus unlikely to be appropriate as initial augmentative systems. In this regard, Yoder and Kraat (1983) stress the importance of remembering that normal children are not asked to acquire reading and spelling skills until long after they have mastered the skills of speech communication. Speed of transmission is also slower when using letter boards or fingerspelling as the individual has to spell out each word, rather than indicating a symbol or sign representing one word or concept.

On the question of neuromotor requirements, one of the major disadvantages of using a contrived sign system such as the PGSS or a sign language such as ASL, is that relatively fine motor movements are often necessary and, if the standardized sign is even slightly altered, the content communicated may be changed (Hamre-Nietupski, Stroll, Holtz et al., 1977). The use of such systems with the severely physically handicapped would thus be severely limited. Fingerspelling, too, requires extremely fine hand and finger movements. In contrast, mime and naturalistic gestures require significantly fewer fine motor skills, and Daniloff and Vergara (1984) have provided evidence that in the case of Amer-Ind, too, the production requirements are motorically simpler than those of ASL. It must, however, be remembered that these latter systems cannot provide their users with all the complexities and flexibility of a true language system.

The intelligibility of augmentative systems to untrained individuals is another important consideration. Naturalistic gestures and mime are relatively intelligible if done well. Skelly (1979) claimed 80% to 90% intelligibility for Amer-Ind signals, although Daniloff, Lloyd and Fristoe (1983) found that approximately 50% of signals were guessable. In contrast, only 10% to 20% of ASL signs have been found to be guessable by naive individuals. Signed English (where the signs are not derived from ASL) and the manual alphabet are typically non-guessable (Lloyd and Karlan, 1984). Pictures and Rebus symbols for objects are generally highly intelligible, though they may be ambiguous when used to represent actions or emotions. Blissymbols in themselves are probably not highly intelligible to untrained observers, but when they are used on communication boards they are accompanied by their English language equivalents and so may be readily intelligible to anyone who can read. Confusion could however persist concerning messages formed through combinations of symbols. In contrast to the question of the intelligibility of the systems to naive observers, the issue of the social value and acceptability of the different systems to the users and significant others has been explored hardly at all (Kiernan, 1977) and there are as yet no guidelines for comparing augmentative systems on this criterion.

Which augmentative system is selected for training further depends in part on the extent to which a given system mirrors English syntax. Correspondence to spoken English is achieved by Signed English, the PGSS, the manual alphabet and traditional orthography, but less so by Bliss and rebus systems, and not at all by ASL,BSL or Amer-Ind. Kiernan (1982) and Bonvillian and Nelson (1978, in Siple, 1978) point to arguments in both directions. They state that if the purpose is to give a child a rich expressive medium paralleling speech, which may be the case particularly for nonverbal persons with intact receptive language, or where the system is viewed as a facilitator of speech or reading, then systems such as Signed English, the PGSS or traditional orthography are appropriate. On the other hand, these systems <u>are</u> cognitively and/or motorically complex. Kiernan further refers to evidence that mentally handicapped children may be able to develop their thinking more successfully in a visuo-spatial medium, suggesting that a visuo-spatially based language such as BSL or ASL, or Amer-Ind may be more suitable for them. In general, however, it can be stated that if an individual is to make progress in learning to use and understand spoken language, it is necessary to use an augmentative system paralleling speech. As such, as far as signing is concerned, Kopchick and Lloyd (1976) and others recommend the use of Signed English, initially without the use of inflectional markers, but with the gradual addition of such markers as the individual becomes more skilled in using the system.

It is clear from the above that no single augmentative system is superior to others. Each has advantages and disadvantages, and the goal is to select the most appropriate system for a given individual. Moreover the most effective system for a child may change as the child develops and acquires additional skills and communicative needs. The selection and development of a communication system is therefore not a one-off decision but a continuous process. In the case of the symbol systems, for example, a child could begin by using concrete objects or pictures, and progress to Blissymbols, and finally to traditional orthography, as his/her competence develops (Kiernan, 1982). It is worth pointing out, however, that Blissymbolics remains a valuable communication system even after reading and spelling skills have been mastered. This is because traditional orthography contains much redundancy, while Blissymbols, based as they are on ideas, and allowing for telegraphic communication, allow for speedier transmission of messages.

One solution to the problem of the limitations of particular systems is to combine the best features of different systems by teaching children sign and symbol systems concurrently. While such an approach would greatly increase the workload (the child would have to learn a sign and a symbol for every word /concept), it would offer increased flexibility in communication. The child would have a chance to become aware of both the static and dynamic modes of communication and would be able to use these for different communicative purposes, depending on which is the fastest, most flexible and most effective in a particular situation. Those children who are unable to maintain more than one system in the long term would at least have the option to select the system that suits them best. MacDonald (1979) suggests that such a combined sign and symbol approach is likely to be particularly appropriate for the severely mentally handicapped child with poor hand function, and for the cerebral palsied child with profound deafness or congenital auditory imperception. While a parallel pair of sign/symbol systems may not necessarily be mutually supporting, the recent development of Worldsign (a system having symbol equivalents for signs) and the introduction of symbol equivalents of Makaton signs (Grove, 1980) are promising developments in this regard.

PART III: AUGMENTATIVE LANGUAGE INTERVENTION WITH NON-VERBAL AND LANGUAGE IMPAIRED CHILDREN: A CRITICAL REVIEW OF THE LITERATURE

The recent attention given to the use of sign and symbol communication systems with language impaired individuals has resulted in a dramatic increase in the number of research studies on this topic since the early 1970s. These teaching and research reports will be reviewed in the present section. It should be noted that studies relating to the use of sign by deaf individuals who are not mentally handicapped will not be covered in this review. The section will end with a discussion of the shortcomings of the research studies conducted to date.

Chapter 8. Research into the Use of Manual Systems of Communication

In 1966 Gardner and Gardner (1969) began training an infant chimpanzee named Washoe in ASL, after realizing that human speech sounds are unsuitable as a medium of communication for the chimpanzee. Within 51 months, Washoe had acquired 132 signs (Gardner and Gardner, 1975). Her rate of acquisition of signs indicated the phenomenon of 'learning to learn'; she further demonstrated spontaneous naming, spontaneous transfer to new referents, and spontaneous sign combinations. Similar success in teaching signs to chimpanzees has been reported by Fouts (1973). While a number of writers (e.g. Brown, 1973) have questioned whether or not these primates actually learned "language", Oxman, Webster and Konstantareas (1978) stress that they were capable of producing and comprehending an extensive vocabulary of signs and that at least some of their signed utterances expressed basic semantic relations employed by humans.

The classic study by the Gardners gave impetus to the exploration of signing as a possible method of communication for severely language impaired individuals other than the normally intelligent deaf population. It has now been demonstrated that signing skills can be acquired with at least some degree of success by diverse populations, including mentally handicapped deaf and hearing individuals, physically handicapped, autistic and aphasic individuals and glossectomy patients. Studies into the use of manual communication with these populations will be discussed below, with particular attention to descriptions of the training given and details of outcome. Other issues considered in the research literature, including the question of the impact of training on speech, and data on factors predictive of success in augmentative system use, will be discussed in later chapters.

8.1 The Use of Manual Systems with the Mentally Handicapped

The earliest studies into the use of signing as an augmentative communication system for the mentally handicapped were with deaf mentally handicapped, and mostly adult, subjects. Sutherland and Beckett (1969) taught signs (probably ASL) to 12 such individuals over a period of 18 months. The subjects ranged in age from 7 to 41 years, and in IQ from 30 to 89. Few details of the training and assessment procedures are given, but at the end of 12 months the subjects were said to be able to distinguish and perform some 300 signs and to combine these in 3 to 5 word utterances. Hall and Talkington (1970) gave 4 hours of daily sign instruction over 6 months to 30 profoundly hearing-impaired mentally handicapped youngsters. There was a mean improvement of 54.6 signs known, and the subjects improved an average of 1 year 4 months on the Mecham Verbal Language Development Scale (Mecham, 1968), compared to a retarded but hearing group which improved only 4 months on this scale and received 'approximately equivalent' classroom time but no sign training. A wide variance was observed within the signing group, but again minimal information is presented on sign use and on the assessment and training procedures employed.

Hoffmeister and Farmer (1972) introduced ASL signs to 16 institutionalized mentally handicapped adults with a wide range of hearing losses. After 24 weekly training sessions, 4 of the 14 subjects who did not know any signs on commencement of the programme, had learned 200 signs which they used spontaneously in combination; 3 subjects learned 150 signs, 3 subjects learned 75 to 100 signs, 1 subject learned 10 signs, and 2 subjects learned only 1 or 2 signs. These latter subjects were considered to be autistic. Berger (1972) incorporated manual signing into a speech training programme for 9 deaf institutionalized children, 6 of whom exhibited limited communicative attempts but no intelligible speech, and 3 of whom had no recognizable communicative behaviour. After 1½ to 2 years of daily instruction, 2 of the younger subjects were initiating a few signs, while the 4 older subjects were said to be combining signing and fingerspelling in sentences.

In the U.K., Cornforth, Johnson and Walker (1974) provide gross results on the use of BSL and speech with 41 deaf mentally handicapped adults resident in 4 subnormality hospitals. Before training the majority of subjects were described as using crude natural gesture, while 'a few had rudimentary speech'. Using flashcards, objects and everyday situations, 145 signs were taught over periods ranging from 9 months to 3 years. The subjects learned to understand and perform between 36 and 138 signs. The authors further note that several subjects spontaneously linked signs in short phrases. Walker (1973, 1977) provides additional data on 14 of these subjects. She reports that after 9 months of training on 110 signs, over half the group learned 90% of the total signs taught, and even the lowest scorer learned 60% of the signs. Great improvement was also found on the Reynell Developmental Language Scales, which were administered using simultaneous signing and speech. There are several difficulties with this study. A number of students were able to identify up to 72 of the signs even before training. Also, as Kiernan, Reid and Jones (1982) point out, comprehension of signs was assessed by presenting subjects with 5 alternative pictures and asking them to identify the picture referred to by a sign, but no correction was made for guessing. The Reynell was administered in a signed form which means that at least some of the observed improvement could have been a simple artifact, reflecting the fact that the subjects were provided with a means of understanding and expression through signs, rather than an increase in language comprehension per se. Further, as most of Walker's measures were ad hoc, with no information on their reliability and validity, the correlations she presents are open to question. Finally, none of her subjects was severely or profoundly mentally handicapped, and one was of average intelligence (Bailey, 1978).

Despite such methodological flaws, and despite the wide variation shown in individual levels of sign mastery, the reports clearly demonstrate the feasibility of teaching signs to deaf mentally handicapped individuals. Soon after the publication of these early reports, research began to focus on the use of signs with the non-deaf mentally handicapped as well. Here too the success achieved among individual subjects varied widely. Wilson (1974), for example, reported a range in sign usage from 32 to 432 different signs by her nonverbal moderately, severely and profoundly mentally handicapped subjects, after 7 months of training in ASL signs. No information is provided on how sign usage was assessed, but it is important to note that of the 26 subjects in this study 6 were cerebral palsied and 5 were diagnosed as having psychotic disorders or other psychiatric impairments. Wilson notes that two of the subjects who had previously demonstrated little or no receptive language, began to exhibit an understanding of speech as well as of signs. Richardson's (1975) report on sign training with 23 severely/profoundly mentally handicapped adults over a period of one to two years, and Balick, Spiegel and Greene's (1976) report on the use of mime with 5 mentally handicapped children, both present little quantitative data, but suggest similar variation in sign mastery. Some of Richardson's subjects, too, were said to be physically handicapped and autistic. Topper (1975) presents a case report of the use of gross motor gestures with an institutionalized adult. Again, no data are given, but it seems that after two months of training the subject was just beginning to initiate some of the gestures on his own.

As noted by Kiernan (1977), since the mid 1970s a number of researchers have stressed the need for back up of sign training in the student's living environment. Although systematic evaluations are usually lacking, as is information on the extent to which adults actually used the signs in the trainee's living environments, these studies indicate that such an approach is likely to foster more generalized usage of sign. Kopchick, Rombach and Smilovitz (1975) found that using total communication only in the classroom did not result in improved communication in the living environment. They therefore introduced a full-time simultaneous speech and signing environment for 11 nonverbal severely mentally handicapped adults, in which staff consistently stimulated and reinforced the use of sign language. Although there was no formal evaluation of sign use or understanding, daily records showed that after 6 months of teaching subjects were using between 45 and 134 signs, and 3 of the group were communicating in 2- or more word phrases. The subjects also improved 20 months on the Fairview Language Evaluation Scale, while a comparison group showed no such improvement. Grinnell, Detamore and Lippke (1976) taught Signed English to 3- to 21-year-old mentally handicapped subjects with varying levels of receptive and expressive speech. They too stressed the need for a consistent signing environment and trained parents in the use of sign. The number of signs learned ranged from 1 to over 200, depending on ability, and many of the subjects were said to use signed phrases and sentences. Improvement for the more able subjects was also noted in the use of correct grammatical inflections and word order.

Stremel-Campbell, Cantrell and Halle (1977) and Linville (1977) note, again without much specific data, spontaneous signing by 13 nonverbal mentally handicapped youngsters who were trained in ASL signs within a Signed English framework. Of Stremel-Campbell et al.'s 9 subjects, 4 had previously made no progress in a verbal programme. After 10 months of training, all 4 of Linville's subjects understood 200 signs, and 3 of the 4 used 100 signs or more. The subjects were further seen signing to themselves in play and were said to show increased comprehension of spoken words. Improved comprehension of speech and limited facilitation of expressive speech following training in ASL signs linked with rebuses was also noted in a brief report by Wolf and McAlonie (1977). More recent confirmation of such results can be found in Stull, Edkins, Krause et al.'s

(1980) report on a 7-year-old nonverbal severely mentally handicapped child exposed to signs in sign training sessions and during naturally occurring daily events; and in Hobson and Duncan's (1979) description of a sign training programme for 9 severely and profoundly mentally handicapped Downs' Syndrome adults, who mastered between 6 and 42 signs after only 6 weeks.

In the U.K., Bailey and Tait (1979) offer a brief description of the use of BSL signing within the Makaton Vocabulary with 5 severely mentally handicapped nonverbal individuals aged 13 to 17 years. Minimal information is provided about the subjects or their progress. After 12 months the subjects comprehended between 4 and 41 signs and used between 0 and 4 signs spontaneously. While these results reflect a much lower level of sign usage than that reported in some of the other studies, it must be noted that these subjects received only 20 minutes of training per week over the twelve month period. Improvement on the Reynell Comprehension Scale over this time was also limited (a mean improvement of 2.06 months). Kiernan, Reid and Jones' (1982) wide-ranging survey of the use of signing in special schools and units in the U.K. (which was mostly within the framework of the Makaton Vocabulary) tends to confirm the picture of limited progress found by Bailey and Tait. On the basis of postal questionnaires, Kiernan et al.found that amongst Severely Educationally Subnormal (ESN(S)) Day School children in signing programmes lasting from 6 to 18 months, the 'median child' could understand between 11 and 20 signs, and use between 5 and 10 signs. Furthermore, the majority of the ESN(S) children were found to be using only 1 sign per utterance, and to be using signs exclusively in formal teaching situations. Reid (1981) visited 16 ESN(S) schools that were using signing - mostly BSL with the Makaton Vocabulary. All 16 schools reported difficulty in getting their pupils to use the signs they had been taught spontaneously, and 7 of the schools reported little generalization of sign use from the training sessions to other settings. Significantly, only 4 schools had attempted to provide the children with a signing environment where all staff and at least some speaking children used signing. It is thus clear that the dramatic progress reported in many of the research studies is often not borne out in school-based training programmes, most probably because of the much more limited training input that is given.

A number of researchers have suggested that Amer-Ind may be preferable to ASL or BSL for mentally handicapped children because of its concreteness and reportedly high intelligibility to untrained observers. Duncan and Silverman (1977) taught Amer-Ind to 32 moderately mentally handicapped individuals aged 3 to 19 years in a 10-week total communication programme. Signal use was reinforced at home and throughout the school day. The subjects learned between 15 and 200 signals and 27 of them used Amer-Ind spontaneously. In a largely anecdotal account, Skelly (1979) reports on a further group of 16 severely and profoundly mentally handicapped subjects who were enrolled in a 20-week Amer-Ind training programme. Two of the subjects were said to be too severely handicapped to respond to training, while the 14 remaining subjects learned to understand and use between 0 and 39 signals. Similarly, of 21 profoundly and severely mentally handicapped youngsters exposed to Amer-Ind over 12 weeks, Daniloff and Shafer (1981) report that 2 failed to make any progress, one moved, while the remaining 18 subjects learned between 1 and 33 signals. Signal combinations were used by 5 of the subjects.

Children with Down's Syndrome are typically seriously deficient in oral language expression and articulation of speech, even when compared to their language comprehension, but they tend to have good motor skills (Yarter, 1980). As a result, a few workers have suggested augmenting their lagging verbal skills by introducing signing at very early stages of development. McDade, Simpson and Booth (1980) briefly describe the progress of 3 Down's Syndrome children who were first exposed to simultaneous communication training at the ages of 31 to 33 months, after minimal progress in speech therapy.. Progress for one child was very slow, but the other two children began signing and speaking spontaneously one month and six months respectively after the start of the programme. After 9 months one of these two children had dropped the signs and was speaking in 3 - and 4 - word utterances. Le Prevost (1983) encouraged the mother of a 10-month Down's Syndrome child to use Makaton Vocabulary signs and speech with the child. By age 18 months the child was using 15 signs together with immature spoken word forms, and at 3 years 2 - and 3-word spoken utterances were being produced.

Training techniques in all the above studies commonly included the use of imitation, hand moulding,prompting, and picture and object cues, and the majority taught signing within the framework of a simultaneous communication programme. However, the programmes varied widely in length and number of teaching sessions, in the amount of back-up to sign training available outside of formal teaching sessions, in the type of manual communication system taught, and indeed in the criteria used for reporting sign acquisition. The subjects themselves ranged in age from under 3 years through to adulthood, with varying degrees of mental handicap, and often additional handicaps as well. The wide range in reported outcome is thus not surprising. While Kiernan, Reid and Jones (1982) properly assert that the studies are sufficiently numerous and convincing, despite their methodological limitations, to show that language impaired mentally handicapped individuals can learn to communicate using signs, it is important to point out that the establishment of a large repertoire of signs and the spontaneous use of sign combinations is reported for only a proportion of subjects (e.g. Richardson, 1975). Moreover, for a small number of individuals sign training has been completely unsuccessful. Murphy, Steele et al.(1977) report on a mentally handicapped boy with autistic features who failed to learn any Paget Gorman signs despite intensive operant training, while Lancioni (1983) was forced to abandon a sign training programme with 3 severely mentally handicapped children (2 of whom were autistic) because of lack of progress.

There are only a few studies in which aspects of the subjects' response to manual communication training have been investigated in an experimental setting, with discrete trials carefully designed according to established experimental design criteria. One of the critical issues dealt with by these few studies is the relative efficacy of sign and speech training. Kahn (1977, 1981) compared the use of sign training in a simultaneous communication framework, with verbal training and a placebo control procedure in 12 severely mentally handicapped children. No significant difference was found between the sign and speech training groups in terms of progress in language skills, and both groups showed significantly more progress than the placebo group. However, examination of the two communication training groups showed that all 4 of the signing subjects learned some signs and at least 1 combination of signs into phrases, and 2 of them began to use a few words each. By contrast, only 2 of the 4 speech training subjects learned any words, and only 1 of these subjects learned to combine words. Kahn thus concludes that the sign language training appeared to be the more effective procedure for children having a poor prognosis for learning speech. Unfortunately he presents no details of how sign and speech acquisition were assessed. Moreover, there were only 4 children in each experimental group. Weller and Mahoney (1983) similarly compared the effectiveness of speech-only and speech-plus-sign training in matched groups of Down's Syndrome children. Both groups made significant gains in language and cognitive development over the 5 months of the study, with no differences between them, except that the total communication group achieved a greater total lexicon than the speech-only group. In a series of experimental studies, Reid (1984) examined some of the processes which may be relevant to the success of sign teaching. She compared the rate of expressive learning and subsequent recall of simple contrived signs and nonsense syllables as names for cartoon figures in severely mentally handicapped children. She found a clear advantage for acquisition rates of signs over words for 70% of the subjects. This result is consistent with the reported literature on sign acquisition of subjects who had failed to learn speech, and suggests that the processing of manual signs during label acquisition may be easier than the processing of spoken words. By contrast, no differences were found between rates of sign recall and word recall. Reid thus suggests that the advantages for signs, present in relation to acquisition, may not be a general feature of cognitive processing by mentally handicapped children. It is of course important to bear in mind the problems inherent in such a study in attempting to equate words and signs for difficulty.

There are, to date, a number of experimental studies which investigate aspects of instructional procedures in sign training with the mentally handicapped, and the impact of such training on speech. These studies will be discussed separately below.

8.2 The Use of Manual Systems with Autistic Individuals

As a result of the well known difficulties in attempting to develop speech in nonverbal autistic individuals (Sailor, Guess and Baer, 1973), an increasing number of researchers and teachers have turned towards the use of sign language with this population. While the reports available to date are mostly small scale, and while, as is the case for the mentally handicapped population, there are few systematic comparisons of the efficacy of speech versus sign training, the research does seem to indicate that signs may be acquired much more readily than speech by language impaired autistic individuals (Light, Remington and Porter, 1982).

The earliest reported successful use of signs with autistic children was by Creedon at the David School (Creedon, 1973, 1976, 1981; Offir, 1976). Signed English signs and words were used simultaneously by the school staff. Creedon (1973) reported that all the 21 severely mentally handicapped nonverbal autistic children with whom she worked for between 1 and 3 years learned to sign, and used at least two-sign combinations to signal their interests, needs and emotional states. The use of 'egocentric' signing for self-regulation of activity was also noted. In a follow-up report, Creedon (1976) described the continued progress of 30 children over the first 5 years at the school. Approximately two-thirds of them developed some speech, and 8 were using 'fluent speech' without sign. On testing, some of these children were said to have moved into the mildly retarded to normal IQ range, and to have developed some reading and writing skills. Yet Creedon noted that even among those who continued to function at severe levels of mental handicap there were children who used several words as well as multi-sign utterances. In a more recent follow-up (Creedon, 1981) of 16 of the children, between 3 years 9 months and 7 years 9 months after they had been transferred out of the programmes, 5 children were said to rely only on speech, 3 only on sign, and 8 on signs and speech. Overall, Creedon's reports provide some useful information on the process of sign language acquisition over several years, but unfortunately they contain little quantitative data.

Miller and Miller (1973) taught 19 severely disturbed mute autistic individuals aged 5 to 20 years to use and understand signs related to functional activities or goals, using simultaneous communication together with body awareness exercises and language training films. After between 4 and 36 months of daily training sessions, the children learned to use a median of 8 signs and to understand a median of 27 signs. All the children (even the most severely disturbed) learned to initiate some signs and to respond to spoken words that had been paired with the signs, and one child progressed to using 'appropriate' spoken language. In this study, too, the methods used to assess sign and speech mastery are not described. Webster, McPherson, Sloman et al. (1973) reported on the relative effectiveness of simultaneous sign and speech communication training with a 5½-year-old mute autistic boy, after unsuccessfully attempting to teach him simple discriminations based on verbal instructions over more than 7 months. After 24 one-hour sessions the boy had learned to respond to and produce a limited number of signed commands. Very few data are presented but 6½ years later, after 2 years of intensive sign training, he was said to be using at least 18 spontaneous signs and understanding some 60 signs (Webster, McPherson, Sloman et al., 1980).

The relative ease with which some nonverbal mentally handicapped autistic children acquire a productive sign vocabulary is clearly demonstrated in the single case reports of Fulwiler and Fouts (1976), Baron and Isensee (1976) and Bonvillian and Nelson (1976, 1978). After only 20 hours of simultaneous communication training with their 5-year-old subject, Fulwiler and Fouts reported acquisition of some 25 ASL signs, and their spontaneous use in 2 - and 3 - sign phrases. Sign combinations were first emitted in the second hour of training. Bonvillian and Nelson's 9-year-old subject produced spontaneous single signs and sign combinations within 3 months of training, after earlier extensive speech training had produced no spontaneous language. The boy was observed signing to himself, as well as engaging others in sign conversations. At 3 years follow-up he was reported to have mastered some 400 signs and his sign combinations indicated a wide range of semantic relations. However, most of his sign utterances remained 2 or 3 signs in length, and he largely failed to use SEE signs he was taught for grammatical markers. It is important to note that the boy's mother, teachers and peers were also trained in sign use. Other researchers, too, have stressed the importance of back-up of sign training in the autistic child's daily environment. In Casey's (1978) study of 4 6 - and 7-year-old autistic boys, both mothers and teachers were trained to use Signed English with the children. By 3 months follow-up, 3 subjects were said to use spontaneous signing and verbalizations; the fourth subject's progress was apparently much slower. Salvin, Routh, Foster and Lovejoy (1977) taught simplified ASL signs to a 5-year-old mute autistic child, and also to his mother and teachers. As a result, he continued to acquire new signs even after the termination of the formal training programme and was reported to use signs spontaneously in situations other than the training sessions. Layton and Baker's (1981) mentally handicapped autistic subject received one 30-minute sign training session a day as well as continuous exposure to signing throughout the school day, over 1½ years. The authors present a detailed analysis of the range of semantic relations expressed in the child's spontaneous multi-sign utterances.

Benaroya, Wesley, Ogilvie et al.(1977, 1979) taught Signed English and speech to 6 mute autistic children, after first exposing them to intrusive play and training in imitation of body movements. After 5 months the children had learned between 17 and 81 signs, and 4 of them were signing spontaneously. Improved performance was also found on the Columbia Mental Maturity Scale, but not on the Peabody Picture Vocabulary Test. The authors suggested in this regard that sign language training may have more bearing on the tasks involved in the Columbia Test. In their brief 1979 report, Benaroya et al.gave an anecdotal account of continued increases in the children's sign vocabularies over the second year of training, as well as improvements in verbalizations and speech for some of the subjects. Konstantareas, Oxman and Webster (1977) and Konstantareas, Webster and Oxman (1979) trained two groups of severely mentally handicapped autistic children in simultaneous communication over 5 weeks and 9 months respectively. Over half of the subjects were mute, while the remainder had limited verbalizations or echolalic speech. In the shorter programme, 5 subjects learned to understand between 10 and 90 signs, and 4 of the children produced up to 52 signs spontaneously. The fifth child acquired no sign production. In the 9-month programme, too, Konstantareas et al. note considerable variability among the subjects, both in terms of the total number of signs employed, and the manner in which they were used. The 4 children mastered between 100 and 270 signs, although spontaneous use of the signs was significantly lower for 3 of the children. Their signed utterances reflected a wide range of pragmatic content, but labelling and requests were in fact the most common pragmatic categories used. Testing revealed no improvements on the Reynell Developmental Language Scales, Stanford-Binet or Illinois Test of Psycholinguistic Abilities, but the authors report that performance indicated qualitative gains in test-taking skills, interest in tasks and comprehension. Unfortunately, the all too common criticism of inadequate data presentation is also applicable to this study. Variation in progress in sign acquisition was further reported for 2 mentally handicapped children with 'autistic behaviours' trained by Stull, Edkins, Krause et al. (1980). After 10 months of training one child was spontaneously using 16 signs, while the second child had made gradual progress in imitation and understanding of some signs but showed no spontaneous production. The two children also showed very different patterns of acquisition, one child making very little progress in the first three months of training but improving rapidly thereafter, and the second child showing gradual improvement. This study is important in indicating that progress may be slow and that even if no improvement is found in the first months of training, persisting with signing may well yield results after some time. Interestingly, Hinerman, Jenson, Walker and Peterson (1982) also report very slow acquisition of sign imitation by their 5-year-old low-functioning autistic subject. It was only after hundreds of trials and the introduction of an unrelated contingent exercise, intended to punish incorrect responding, that the child finally began to imitate the correct signed words. Once imitation was established, however, he quickly learned to respond to an object with its correct sign and subsequently learned a few more signs, although he never used signs spontaneously.

Limited achievements were also reported by Carr, Binkoff, Kologinsky and Eddy (1978). Their subjects were 4 nonverbal autistic children aged 10 to 15 years, who had failed to make any progress over 1 to 3 years of speech therapy. The children were successfully taught expressive sign labels for 5 foods in a multiple baseline design, using prompting and fading techniques, stimulus rotation and reinforcement. There was considerable variability across children with respect to the number of trials required to learn the signs, but after training each child's correct signing remained at a high level even when tested by adults not associated with the original training. Subsequently, 3 of the subjects learned a further 15 signs in many fewer trials, which is indicative of a 'learning set' phenomenon also noted by other researchers.

The most carefully documented signing programme with autistic children was reported by Schaeffer, Musil et al. (1977, 1980; Schaeffer, 1980b). The programme has so far been used with only 3 autistic boys aged 4½ to 5½ years, 2 of whom were mute and 1 minimally echolalic; but it resulted in great improvement. The programme is highly structured and aims to achieve a transfer from sign to speech. Initially the children were taught signs and verbal imitation in separate sessions. After about 5 months they began to produce approximations to words and were then taught to sign and speak simultaneously. Some 9 months into the programme the children began speaking spontaneously without signing and at this point the use of signs was systematically faded. The children thus learned to produce spontaneous multi-word utterances in sign, in simultaneous speech and sign, and then in speech alone. The simultaneous use of sign language and speech apparently effected a transfer of spontaneity from sign to speech. It must however be noted that the intensive training given, of 4 hours daily one-to-one teaching, no doubt also contributed to the success of the programme.

Overall, the above studies demonstrate that severely language impaired autistic individuals, many of whom had previously shown no progress in speech-oriented programmes, were able to learn a variety of language and communication skills through the medium of signing. Most of these individuals were children, and most were described as mute and mentally handicapped at the beginning of programmes. However, as Kiernan (1983a) points out, detailed descriptions of subjects' communicative abilities, intelligence levels and progress in sign use, are rare; and few of the studies give a detailed enough description of the subjects to allow classification in line with two or more of Rutter's (1978) four essential criteria for autism (Kiernan, Reid and Jones, 1982). There is also no information on the extent to which autistic children's use of sign manifests the types of problems typically found in their speech, for example the use of stereotyped utterances. In addition, as is the case with the literature on mentally handicapped individuals, it is difficult to determine which specific aspects of the training procedures are responsible for language development since the majority of studies are uncontrolled. In one of the few studies using a control procedure, Barrera and Azaroff (1983) examined the relative effectiveness of oral speech training and total communication training for teaching expressive labelling skills to 3 echolalic autistic children. For each subject, total communication was found to be the more successful approach. Brady and Smouse (1978) came to the same conclusion This study, and the few other reports which have included controls for various aspects of the training procedures will be more fully discussed in a later section.

Finally, it is important to note that rates of learning and outcome for individual autistic subjects varied widely. Some children acquired facility in sign and used several hundred signs in multi-sign utterances, a number progressing to the use of spoken English (e.g. Schaeffer, 1980b); while other children learned only a few signs each. Lancioni (1983) and Murphy, Steele et al. (1977) failed to teach any signs to 3 low-functioning children who had autistic features. Some studies report spontaneous use of signs, but Carr and Kologinsky (1983) had to programme for spontaneous use by making things which the children liked available only if they signed appropriately. As has been pointed out by Kiernan (1983a), duration of the programmes and differences in teaching techniques and in subject characteristics are all likely to have played a role in such variation.

8.3 The Use of Manual Systems with Aphasic, Apraxic and Surgery Patients

There is some experimental research evidence suggesting that aphasics may have difficulty in using nonverbal communication systems and signs. Duffy, Duffy and Pearson (1975), for example, noted the severe pantomimic deficits of many aphasics, and maintained that, in their experience, training in the use of nonverbal communication would be unsuccessful because aphasia is a disorder of central symbolic skills. On the other hand, a number of recent clinical studies indicate that at least some aphasics not able to verbalize can learn to use gestures and signs to express themselves. At present there have been only a few such studies of sign language acquisition by aphasic individuals, and they have been generally encouraging. However, as Orlansky and Bonvillian (1983) point out, these studies are largely exploratory; the performance of individuals varies greatly, and investigators are as yet unable to predict which aphasic individuals will derive maximum benefit from sign training.

Bonvillian and Friedman (1978) briefly describe acquisition of signs by an aphasic adult who had suffered severe brain injuries. After 9 months of weekly training sessions, the man was using at least 79 signs spontaneously. He also began using combined signs after the instructors had modelled sign phrases. Stuart-Smith and Wilks (1979) taught 45 conventionalised gestures to 4 individuals who had suffered a left hemisphere cerebro-vascular accident resulting in severe aphasia, with an added apraxic component in 2 cases. The gestures were taught in 8 weekly 2½-hour sessions, using film and role-play demonstrations with real objects and pictures. Relatives and para-medical staff were also given training in the gestures. Two of the subjects learned 61% of the gestures, while one subject showed no improvement. No information is given on the spontaneous use of the gestures outside of training sessions. Schlanger and Freimann (1979), too, found that aphasic adults' pantomimic ability can improve with training, when compared with untrained controls. Generalization of communicative use of the gestures to other settings was reported, but again this was not formally assessed. In another largely anecdotal report, Kirshner and Webb (1981) used Amer-Ind and ASL signs with a 39-year-old woman who had suffered bihemispheral infarcts and developed almost total loss of speech and of auditory comprehension, although with relative sparing of visual language. In 8 months she acquired 127 signs and began to communicate with her family through sign. Her spontaneous sign expressions, however, remained limited to 1 - and 2 - sign phrases and to very concrete subject matter.

In a much earlier study, Chen (1968, 1971) introduced 26 aphasic patients to a combined fingerspelling and gestural system. Half of the group learned to communicate with the gestures and by spelling out words; 7 learned a few manual letters, while 6 were unable to learn any letters or gestures. The failures in this study were said to be the patients with sensory aphasia with severe brain damage, with poor memory, and those 'unwilling to learn or cooperate'. Eagleson, Vaughn and Knudson (1970) devised 12 self-care signals for use by 31 expressive aphasics. All used the system to communicate their basic needs, but no data are given.

Turning to the use of sign with children, Brookner and Murphy (1975) present a detailed case report of the use of total communication with a severely mentally handicapped boy with severe receptive and expressive aphasia. They report that the child had experienced normal development until suffering severe head trauma at age 4. At 13 years he could read and write simple sentences but did not communicate spontaneously. In 9 months of sign training the boy learned 160 signs and used spontaneous sign combinations. Hughes (1974/5) and Caparulo and Cohen (1977) also used sign training with aphasic children. Although the children made progress, the reports give few programme details or outcome measures.

Skelly and her colleagues have presented a series of studies and field reports on the use of Amer-Ind with over 200 adults whose primary communication disability developed in maturity, against a background of normal development (Kiernan, Reid and Jones,1982). These subjects included apraxic, aphasic and surgery patients. In two early reports Skelly, Schinsky, Smith et al.(1974, 1975) taught Amer-Ind to 20 individuals, including apraxics, dysarthrics and glossectomees. Subjects learned between 20 and 200 signals over 6 months,and used speech to accompany the signals with varying degrees of proficiency. In both studies results are described in a gross way, indicating only the number of signals acquired, with no information on spontaneous usage or the methods used to determine signal mastery. Moreover, little information is provided on subject characteristics. In 1979 Skelly presented additional data on Amer-Ind training with 43 individuals, including 9 cancer patients and 20 aphasics. According to Skelly, the rationale for using the Amer-Ind Code with the cancer group, who had suffered excision of the larynx and tongue, was that it would provide faster communication than writing, would preserve eye contact, and might motivate persistence on compensatory speech techniques. Again, no information is given on how progress was assessed. Over periods of of 3 to 12 months subjects mastered between 35 and 200 signals, which they used with varying levels of proficiency. Of the 20 aphasic subjects, 12 achieved propositional use of Amer-Ind, while the others used some signals for expression of needs. Skelly (1979) presents information on 160 additional aphasic patients who were taught Amer-Ind by other clinicians. Unfortunately, much of the information is anecdotal, so that there are no data to indicate for which of these individuals Amer-Ind is likely to be most useful.

8.4 The Use of Manual Systems with Physically and Multiply Handicapped Individuals

The use of manual systems of communication requires a certain degree of motor coordination and manual flexibility not normally found among individuals with cerebral palsy. However, a few studies have examined the use of sign or gesture by cerebral palsied subjects with at least limited motoric facility, most of whom were also mentally handicapped.

In one of the first of such studies, Levett (1969, 1971a, 1971b) devised a system of mime to facilitate communication for a group of 12 severely mentally handicapped, nonverbal cerebral palsied children at Meldreth Training School. The system consisted of a vocabulary of 100 gestures designed to resemble activities or objects, which were taught in daily training sessions for 4 to 16 weeks. All staff and parents were taught the system and encouraged to use it in a simultaneous speech-mime framework. All 12 children were reported as understanding the system, 7 used it spontaneously and 3 used it in a limited way. Two children did not use the system at all. Of these 2, one child was hemiplegic (the system is a two-handed one), and the other had severe emotional problems. Levett gives no quantitative data, nor any information on how progress was assessed. After initial success with the Meldreth Mime, it was decided that some of the handicapped children could probably acquire a formal sign system, and PGSS was introduced at the school (Fenn and Rowe, 1975). A number of studies using sign with the mentally handicapped have included some cerebral palsied individuals among their subjects (e.g. Daniloff and Shafer, 1981; Kopchick, Rombach and Smilowitz, 1975; Richardson, 1975; Wilson, 1974); however, they do not report separate results for the physically handicapped groups. There were some cerebral palsied individuals in Cornforth, Johnson and Walker's (1974) study on the use of BSL with 41 mentally handicapped institutionalized adults. On average, the cerebral palsied subjects achieved lower scores on signs used and understood than did the other subjects, which may have been due to their greater physical difficulties in producing signs. Van Mierlo (1975) introduced signs to 7 deaf mentally handicapped cerebral palsied subjects, 6 of whom were spastic and 1 athetoid. All showed some progress, but no quantitative data are reported. Similarly, Egan, Anthony and Honke (1976) and Gitlis (1975) each used manual sign language with one cerebral palsied subject, with good results. These reports, too, are largely anecdotal.

Fenn and Rowe's (1975) description of the use of PGSS with a group of 7 severely mentally handicapped, deaf cerebral palsied children is extremely valuable in its attempt to analyse some of the linguistic aspects of sign use. All of the children had a sufficient degree of manual coordination to enable them to sign intelligibly. Fenn and Rowe report that initially a group of children was exposed to fluent signing of fully grammatical sentences, but that this approach was unsuccessful because, after several months, the children still showed no indication of acquiring any kind of syntactic rule system. The authors therefore introduced a structured approach, beginning with 'telegraphic' signing, with more arbitrary parts of speech such as functors being introduced and taught once the child had mastered the more basic conceptual aspects. Thus they first taught a series of nouns which were used frequently in the child's daily life, moving on to link two related nouns in response to objects and pictures. Nouns were then linked with verbs, adjectives and prepositions. In the next stage, subject-verb-object relations were taught, and then grammatical markers such as the present participle and plural and tense endings were added. Teaching involved simultaneous word-sign presentation and the introduction of signs in realistic contexts. After 6 months, improvement was reported on the Sentence Comprehension Test (Hobsbaum and Mittler, 1971), indicating substantial understanding of syntactic structures. Expressive signing abilities were assessed through video-tape recordings of sign conversations, in which the children showed all the semantic relations characteristic of Brown's (1973) first stage of normal speech - including entity naming, locative and negation. Thus, over 6 months the children learned to understand a wide variety of semantic relations and to express these in spontaneous sign combinations. The children also began to sign to one another. However, this study still omits much information, including data on pre-training communicative abilities, reliabilities for analysing the expressive sign samples, and details of the frequencies of semantic categories and sign utterances produced.

Rowe (1978) presented anecdotal accounts of the progress of 6 cerebral palsied children with varying degrees of hearing impairment, who were trained in PGSS signs within a simultaneous communication framework. Two of the children, who began signing at ages 7 and 9 years respectively, were said to be nearing a 5-year level for language expression and comprehension after 5 years of sign training. Fouts, Shapiro and O'Neal (1978) reported success in teaching ASL to a nonverbal 8-year-old cerebral palsied child who had control over gross motor movements of his arms and hands. After 13 half-hour training sessions the child had acquired some 73 signs and produced about 150 different sign combinations. Again, minimal quantitative data are provided, as is the case for Skelly's (1979) group of 20 severely and profoundly mentally and physically handicapped subjects, aged 8 to 47 years, who were trained in Amer-Ind. These subjects acquired between 47 and 9 signals over 20 weeks, with 1 subject using signals at the level of propositional speech, 13 using signals to express their needs and wishes and to answer questions, and 4 not yet using the Code functionally.

None of the above studies using cerebral palsied children provides adequate information on subject characteristics, training procedures used and levels of communicative competence attained, and none gives sufficient detail on the extent to which the speech musculature was involved in the failure of normal speech development (Kiernan, 1977). Nevertheless, these studies do indicate the value of sign training for many cerebral palsied individuals.

Very recently, a number of case studies and reports have been published documenting the effectiveness of sign training with multihandicapped individuals with little or no vision. In such programmes signs are often presented tactually. Sininger and Yarnall (1981) taught a 25 year-old deaf-blind person, who was also mentally handicapped, to respond appropriately to 6 different sign instructions. Wilson (1983) taught signs from Australian Sign Language to 5 severely mentally handicapped deaf-blind children aged 6 to 8 years. All subjects were functioning at developmental levels below 2 years, and receptive and expressive language levels of 4 to 5 months; none displayed any formal communication ability or any motivation to communicate. After 1½ years the children had all learned to respond to a variety of receptive signs but none was using any signs spontaneously. Training in sign labelling was then introduced and all the children learned to produce between 18 and 33 sign labels in 6 months. After a further 6 months, the children were responding to 36 verb-noun instructions and some were producing signs spontaneously. Wilson noted an 18 months improvement in language expression and reception skills over the 2½ years of the project, whereas little change occurred in a contrast group of 12 children who obtained similar scores to the experimental group at pre-test, were 4 years older, and received no training. Konstantareas, Hunter and Sloman (1982) successfully applied sign and speech training with a blind, severely retarded 10-year-old autistic girl who, after 8 months of training, used 19 spontaneous signs and 2 - and 3 - sign combinations. Finally, Rittenhouse (1983) reported on a 6-week sign training programme with 10 mentally handicapped subjects aged 9 to 19 years, 1 of whom was deaf-blind, 3 blind, 3 deaf and 2 emotionally disturbed. The subjects acquired between 0 and 200 signs, with 4 of the subjects acquiring more than 10 signs. These preliminary successes in sign training with such severely handicapped groups as the deaf-blind are promising indeed.

8.5 The Influence of the Characteristics of Signs on Sign Acquisition

The studies reviewed above indicate that manual communication training can significantly improve the communicative abilities of nonverbal and language impaired individuals. While most of these studies are poorly reported, recording the data on sign and speech acquisition in an anecdotal fashion, and with uncertain reliability and generality of the results, the fact that they concluded that a high percentage of subjects improved in their ability to communicate, provides strong support for this conclusion. However, as already noted, there is large variation in the effectiveness of the programmes in terms of the rate and breadth of sign vocabulary growth, the degree to which spontaneous and functional sign production occurs, and the use of sign combinations. This variability would seem to be due partly to individual differences, and partly to the degree of consistency of the signer's augmentative communication environment and the nature and duration of the training programmes. Studies concerning the role played by these factors will be reviewed in later sections. In addition, the signs themselves have different features which may well make them more or less difficult to learn. The growing body of literature examining the influence on sign acquisition exerted by characteristics of signs themselves will be discussed in the present section.

Choices of initial sign lexicons to be taught have often been made on the basis of intuition by the teacher as to which signs ought to be taught (Luftig, 1983). There are, however, a number of recent reports providing general guidelines for vocabulary selection. These guidelines are important to bear in mind, as inappropriate initial sign vocabularies may have detrimental effects on the efficacy of a signing programme. The most logical order for presenting signs for training is to present first the signs that will be easiest to learn. This should speed up initial learning and provide motivation for continued progress (Mills, 1984). Among the factors that have been identified thus far as being relevant to sign acquisition are the functional utility of signs, their iconicity, the concreteness of referents, and the motoric and topographical features of signs.

A number of writers, including Blau (1984) and Nietupski and Hamre-Nietupski (1979), argue that the primary goal in early lexicon planning is to select items that have the broadest functional utility and highest interest value for the individual. Factors proposed by Blau as important considerations for sign selection include: 1. Vocabulary items which the sign user and primary caregivers consider important (for example, an individual's preoccupation with a particular object). 2. Items which reflect routine events experienced by the sign user. 3. Items which reflect preferences or dislikes for objects, actions or people in the environment. 4. Items reflecting basic bodily needs and internal/emotional states, and 5. Items which may code communicative functions and semantic notions which the nonspeaker is already expressing through idiosyncratic signal systems. Additional considerations noted by Blau include: 1. Items which may be used to code a variety of communicative functions or semantic notions, and which thus possess a high degree of functional utility. 2. Items which have potential use for multiword combinations, and 3. The frequency with which items can be used in a variety of settings. Items that can be frequently used will hold high functional value and will provide numerous contexts for learning. Bloom and Lahey (1978) note, for example, that verbs such as "give" and "get" are less object specific than verbs such as "throw" or "drink", and will therefore have more potential for communication in many different situations. Lahey and Bloom (1977) stress the importance of two additional factors in initial lexical item selection, namely the availability of nonlinguistic support and ease of demonstrating a concept in the teaching context.

Several studies have examined the relationship between ease of learning signs and their iconicity, defined by Klima and Bellugi (1979) as the degree to which the elements of a sign or symbol are related to visual aspects of what is denoted. Luftig and Lloyd (1981) and Mills (1984) studied the effects of sign translucency (a judgement of the degree of relatedness by learners between a sign and its meaning), and also concreteness of the referents on learnability of signs, for sign naive individuals. They found that both these factors were reliable predictors of recognition learning. Mills further found that perceived formational complexity of the signs, as rated in the study, had no significant effect on sign learning, while frequency of use of the sign gloss affected learning of signs in one context but not another. Brown (1977) found that a perceived relationship between sign and referent aided sign learning for normal children; and Konstantareas, Oxman and Webster (1978) and Griffith and Robinson (1980) reported similar findings for autistic and mentally handicapped individuals. More recently, Luftig (1983) investigated the effects of sign translucency and referent concreteness with 40 moderately and severely mentally handicapped individuals, confirming that signs judged high in translucency were learned significantly faster than were signs judged to be low in translucency; signs low in translucency and low in concreteness were the most difficult to learn.

Kiernan (1983c) points out that one of the problems with these studies is that meaningfulness of signs has typically been rated by normal adults or children, which is no guarantee that the handicapped see them in the same way. Another complicating factor relates to the definition of iconicity. Smeets and Lancioni (1983) have stressed that iconicity does not represent a unidimensional scale, and that two forms of iconicity should be distinguished: linguistic iconicity, which is defined as the structured, physical or universal characteristic that makes the representational cue evident to naive observers (i.e. the visual correspondence between the representational cue and its referent); and psycholinguistic cues, which do not match the shape of their referents; instead, the referents are implied by other time - culture and experience - bound associations. This distinction suggests that the practice of assessing the degree of iconicity of signs on the judgement of normal adults and children may not be valid. Moreover, it may also account for the conflicting evidence of Kohl (1981) and Wilson (1983), who found no differential effects on the acquisition rate of iconic versus symbolic signs in severely retarded and autistic children. These findings may be due to the authors' definition of iconicity. Depending on their experiences with the object referents, particular signs may be iconic for some individuals but abstract for others (Smeets and Lancioni, 1983). Arick and Krug (1978) were able to facilitate the acquisition of abstract symbols and signs by utilizing refined control procedures and gradual fading of extraneous cues. Smeets and Lancioni (1983) note that such techniques may prove valuable when the flexibility and further extension of a sign vocabulary is restricted by the iconicity of its items.

Overall, then, the results suggest that the rated iconicity of signs and the concreteness of referents should be two of the factors taken into account in the selection of initial signs to be taught. But the issues are not clear-cut, and the exact role of iconicity, and the way it may interact with other variables, cannot as yet be assessed. In any event, iconicity is unlikely to be the only critical variable, since many non-iconic signs are also acquired by severely handicapped children.

Kiernan (1982) and others have shown that other features of signs, particularly how easy or difficult they are to perform motorically, cut across iconicity. For example, Kiernan and Bowler (1980) and Kiernan (1984) found that signs requiring the use of one hand, or two hands assuming the same posture, were easier for mentally handicapped subjects to imitate, learn and recall than signs in which the hands assume independent postures and types of movement. Kiernan (1983a) in fact hypothesizes that iconic signs may well be easier to learn <u>because</u> of response topography. Stremel-Campbell, Cantrell and Halle (1977) and Kohl (1981) found that 'touch' signs (i.e. where the signer's hand physically contacts the other hand or another part of the body) were learned more rapidly by mentally and physically handicapped students than 'non-touch' signs. Hamre-Nietupski, Stroll, Holtz et al.(1977) attribute this finding to the role played by tactile feedback. Kohl additionally found that signs involving symmetrical movement of the hands were acquired faster than were asymmetrical signs, which may be due to the complex discriminations required to produce asymmetrical signs and to motor-coordination differences. Wilson (1983) notes anecdotally that her severely mentally handicapped deaf-blind subjects, too, learned 'touch' signs more readily than 'non-touch' signs, and that the most difficult signs to learn were those made with both hands, where the hand movements were similar but in opposite directions. Wilson does however stress that familiarity through continual use and motivational significance of signs were of overriding significance for acquisition.

It is thus clear that motoric requirements, too, should be considered in initial sign selection. In fact, Dennis, Reichle, Williams and Vogelsberg (1982) recommend that an assessment of what motor patterns learners can perform and have difficulty performing, along with an analysis of the motor patterns involved in signs, should provide useful information in determining signs that may be more rapidly acquired. Signs for which learners can already perform the motor skills can be taught first, and at the same time activities can be set up to teach the motor skills required for other useful signs. On the other hand, Mills and Weldon (1983) caution against teaching together groups of signs which are similar in handshape configuration, location and/or movement, having found that sign-naive hearing adults have greater difficulty in learning to recognize and discriminate between signs which are cheremically similar than between signs which are semantically similar. Griffith and Robinson (1980), too, found that similarities among signs in physical formation interfered with sign acquisition.

8.6 Research on Instructional Techniques for Sign Training

Procedures that have been utilized in the literature for teaching signs to language handicapped individuals typically include: pairing the sign with the referent; moulding, which involves placing the object in the student's hands and moving the hands through the movements of the sign; handshaping or physical guidance, where the teacher guides the student's hands through the sign; imitation, which involves teacher demonstration of the sign followed by student performance; and differential reinforcement (Nietupski and Hamre-Nietupski, 1977). In general, most instructional sequences in studies are designed to progress from physical guidance through to self-initiated performance, and signs are trained within a simultaneous speech and sign framework. As yet, however, there are few formal studies which aim to evaluate the relative effectiveness of the above instructional procedures. The present section will focus on the studies conducted to date which have sought to test specific hypotheses within the teaching situation in an attempt to tease out the factors involved in successful sign training.

While virtually all sign studies use speech and sign, there is a divergence in the methods advocated (Kiernan, Reid and Jones, 1982).

Proponents of the PGSS suggest close matching of signs and speech in simultaneous presentation and with full sentences (Rowe, 1978). Walker (1978) advocates signing only key words but with full spoken sentences, while Skelly (1979) argues that simultaneous presentation of speech and Amer-Ind signals is distracting for students and sequential, rather than simultaneous, presentation is preferable. Schaeffer (1980b) recommends a phasing-in of speech, whereas Bonvillian and Nelson (1978) recommend the use of sign alone. The first group of studies to be examined here concerns the effects of different procedures for integrating speech and sign use in training, which have been examined particularly in the population of autistic children.

Konstantareas, Oxman and Webster (1978) examined the influence of mode of sign presentation on acquisition in 5 mentally handicapped children with autistic features. They found that the subjects acquired receptive signs equally well in response to sign-only and sign-and-speech presentations, and both approaches were superior to speech-only presentation. In other words, the superimposition of speech on sign neither facilitated nor interfered with the subjects' receptive sign learning. It is of course possible that in the simultaneous sign and speech condition the subjects responded only to the signs, disregarding the speech component. However, both Brady and Smouse (1978) and Barrera, Lobato-Barrera and Sulzer-Azaroff (1980) found simultaneous speech and sign training to be superior to either oral - or sign - alone training for two autistic children. In Brady and Smouse's study the subject had received considerable prior training in simultaneous communication, which confounds the results (Bonvillian and Nelson, 1982). Moreover, three different trainers were used for the three different training methods. Nevertheless, their finding is given further support by the work of Konstantareas and Leibovitz (1981), who found a visual-only approach to signing (mouthing of words and signing) to be less effective than a simultaneous visual and auditory approach (speaking and signing) for both receptive and expressive sign acquisition in 8 autistic and/or mentally handicapped children. Interestingly, Beukelman, Yorkston and Waugh (1980) reached the same conclusions in the case of a group of 30 aphasic subjects. Instructions trained in a combined speech plus pantomime approach resulted in higher scores than either the verbal or pantomime approach alone. These studies suggest that total communication is effective as a language training method because the use of physical prompts combined with multisensory inputs provides a broad base for learning, while sign alone involves more limited cueing (Creekmore, 1982).

Despite the above studies supporting total communication as the preferred training mode for signs, there are a number of other studies supporting the use of sign alone. Single case studies reported by Webster, McPherson, Sloman et al. (1973) and Baron and Isensee (1976) both showed superior performance for their autistic subjects in response to a sign-only condition, and contained evidence suggesting that the addition of speech actually led to a deterioration in performance. More recently, Wherry and Edwards (1983) examined the relative effectiveness of verbal, signed and combination systems in operant language training with an autistic boy. While no significant differences among the methods emerged on statistical analysis, the authors found that the boy had more correct responses and a higher percentage of correct-to-total responses in the sign-only condition. As training only lasted for 18 days, it is possible that a more extended training period would have produced more clear-cut results.

The results of this latter group of studies are in line with the findings of an extensive body of literature dealing with the perceptual characteristics of autistic children, which would tend to suggest that there should be no improvement in receptive speech following simultaneous communication training and, furthermore, that since many autistic children seem to be auditorily impaired, one ought to eliminate or at least minimize the amount of auditory input to which they are exposed. As has been clearly summarized by Carr and Dores (1981), this literature demonstrates that autistic children have great difficulty in processing auditory information, especially speech (Hermelin and O'Connor, 1970), and perform poorly on auditory-visual cross-modal association tasks (Bryson, 1972). Clearly, if simultaneous communication were to be effective, some form of cross-modality processing (i.e. from sign to speech) would be necessary. Furthermore, there is an extensive literature on 'stimulus overselectivity' which suggests that when autistic children are confronted with simultaneously presented visual and auditory stimuli (as in simultaneous sign and speech training), they attend to only one of the stimuli, and the direction of the overselectivity is unpredictable (Lovaas, Koegel and Schreibman, 1979; Smeets and Lancioni, 1983). In sum, the literature on auditory and cross-modality processing and on stimulus overselectivity supports the findings of Webster, McPherson, Sloman et al. (1973), Baron and Isensee (1976) and others on the superiority of sign-alone training. On the other hand, it conflicts with the conclusions of Barrera, Lobato-Barrera and Sulzer-Azaroff (1980) and Brady and Smouse (1978), who found the simultaneous sign-plus-speech approach to be more effective than sign-alone or speech-alone training.

A possible explanation for these conflicting results is offered by Carr and Dores (1981). They taught 6 autistic children to identify objects receptively using simultaneous sign and speech. Their 2 mute subjects responded only to the signs, while the 4 subjects with better vocal skills responded to both signs and speech. Carr and Dores further found a high correlation between correct responding on a verbal imitation test and correct responding on the word-only test. These findings, which have been confirmed by Carr, Binkoff, Kologinsky and Eddy (1978), Carr, Pridal and Dores (1984) and Remington and Clarke (1983), suggest that different children respond to different aspects of simultaneous communication training, and that the verbal imitative ability of the student is at least one important factor in predicting the outcome of such training. It can thus be concluded that indiscriminate use of total communication with language impaired autistic children is not necessarily going to be the most effective approach (Kiernan, 1983c). All autistic children do not respond in a similar manner to any given programme and one would need to determine at the beginning of training whether a single modality or a multi-modality approach is likely to be more beneficial for a given child. As stated above, one potentially helpful guideline already identified concerns response on a verbal imitation pretest.

Layton and Helmer (1982) have elaborated further on these conclusions by analyzing the sign and speech comprehension and production performance of 37 low-functioning autistic children under 4 different treatment modes - sign alone, speech alone, simultaneous sign and speech, and alternating between sign and speech. The echolalic children were found to do equally well in all treatment modes. For the nonecholalic subjects, comprehension training was equally effective under all 4 treatments, but sign production training, regardless of treatment mode, was more successful than speech training. Moreover, the nonecholalic subjects in the alternating treatment mode did best overall, particularly in terms of oral word production.

There are, to date, only two studies which examine the relative effectiveness of <u>particular</u> methods of sign-word pairing. Reid (1984) taught severely mentally handicapped children nonsense words and signs alone, words and signs simultaneously presented, words preceding signs, and signs embedded in a full but simple sentence. Sign learning was found to be easier than word learning, but no method was found to be consistently superior with respect to acquisition of words. It must however be stressed that all subjects could use at least single words at the outset. In the second study, Kohl, Karlan and Heal (1979) examined instruction-following behaviour under 3 conditions - verbal instructions only, manual signs paired with words in a one-to-one correspondence, and signs paired only with key meaning words. Both sign training conditions produced greater instruction-following behaviours than did speech-only presentation, and there were no differences in responses for the partial versus complete signing conditions. Thus it seems that the particular method of sign and word pairing is unlikely to be an important consideration in training studies.

Another important issue concerns the generalization of signing. Manual signs are typically trained in isolated instructional settings, and it is only recently that researchers have begun to examine the question of whether sign usage generalizes to other settings and to people other than the trainer(s). Carr, Binkoff, Kologinsky and Eddy (1978), Bonvillian, Nelson and Rhyne (1981), and Duker and Michielsen (1983), found that signs taught generalized to adults besides the original teacher, as well as to settings different from the training sessions. On the other hand, Kohl, Wilcox and Karlan (1978) found that while their moderately handicapped subjects produced the signs they had been taught in response to direct requests for signs, response levels dropped considerably when different cues were introduced. They also found that the greatest number of signs produced in a given probe condition were those signs that had been directly trained in that condition. Furthermore, low levels of spontaneous signing have been noted in a number of studies (e.g. Carr, 1982). It would thus seem imperative to move away from delimited training sessions and to train students in the actual environments where they will be expected to use signing if one is to ensure generalization to natural settings. In fact, relatively few studies have reported direct training of parents, peers and teaching staff, or even stressed the importance of providing a consistent signing environment for students (Casey, 1978 ; Creedon, 1973; Kopchick, Rombach and Smilovitz, 1975).

Recently, however, a number of writers have argued that the use of operant paradigms in sign training is not encompassing enough to teach the functions of language, and they have begun to stress the need for careful planning in order to bring about generalization of sign usage. Carr and Kologinsky (1983) taught 6 autistic subjects with large sign vocabularies but no spontaneous use to sign spontaneously for reinforcers, using a combination of prompting, fading and differential reinforcement techniques. Spontaneous signing was successfully established and generalized across people and settings. Oliver and Halle (1982) identified naturally occurring situations where their subject needed to sign to request objects or actions. A short delay period was introduced in these situations, in which the experimenter first prompted the appropriate signs before fulfilling the child's requests, and gradually faded the prompts. This technique was successful in transferring stimulus control from prompts to naturalistic opportunities in the environment. A similar approach, which involved the use of prompts, capitalized on the child's desires and needs, and incorporated the need for a particular object or action into the existing environment, resulted in generalized and spontaneous use of 2 signs in a study by Culatta and Blackstone (1980). Schepis, Reid, Fitzgerald et al. (1982) also found an increased level of signing in their mentally handicapped and autistic subjects following on the introduction of procedures for staff to prompt student interactions and reinforce student signing in naturally occurring situations.

Among other specific training procedures that have been evaluated is the question of the relative efficiency of two orders for training expressive and receptive use of signs. A commonly held belief is that comprehension precedes production, and that comprehension skills should therefore be taught prior to production skills. However, Watters, Wheeler and Watters (1981) found that simultaneous communication required fewer trials to teach expressive and receptive sign use when training was in the order expressive, followed by receptive training, rather than when the alternative order was used. Smeets and Striefel (1976) also found that expressive sign training facilitated the acquisition of receptive sign use, while the teaching of receptive use first did not facilitate expressive performance. On the other hand, Kohl, Karlan and Heal (1979) reported at least some generalization of receptive sign training to expressive performance for their subjects. Until further evidence is available, it is perhaps advisable to follow Nietupski and Hamre-Nietupski's (1979) recommendation that instruction should be provided on both comprehension and production concurrently. Welch and Pear (1980) and Clibbens, Fawcett and Sweetman (1983) compared the value of using pictures and real objects as training stimuli. Neither method showed any clear teaching advantage over the other in terms of sign production and comprehension scores, or in terms of facilitating generalization of naming responses learned, but there were some important individual differences between subjects. Individual differences and the nature of the task engaged in were also better predictors of sign use than either the type of reinforcement used or the setting where sign training took place (Clibbens et al., 1983). Finally, Kohl, Wilcox and Karlan (1978) found that training in a small group instructional setting facilitated more rapid learning of signs by moderately handicapped subjects compared with individual training. They suggest that the group training sessions gave each student a greater opportunity for repeated sign exposure and practice.

Evaluation of many other aspects of sign training procedures, including the use of modelling, prompting, shaping and fading techniques, have yet to be undertaken.

Chapter 9. Research Into the Use of Symbol Systems of Communication

Compared with the extensive literature on the use of sign systems, relatively little has been published on the use of symbol systems with nonverbal and language impaired individuals, and few conclusions can as yet be drawn concerning the communicative and educational value of these systems. The research to be considered in this section covers reports on the use of Blissymbolics, adaptations of the work of Premack (1970) using abstract symbols, and the application of pictorial symbols and word and letter boards as augmentative communication modes.

9.1 Studies on the Use of Blissymbols

Blissymbols are currently being used with children and adults who are physically handicapped, mentally handicapped, partially hearing, partially sighted, aphasic and language delayed (Bailey and Jenkinson, 1982). However, despite the growing popularity of this augmentative system, there is a paucity of research concerning its efficacy.

A pilot study conducted by McNaughton and Kates (1974) examined symbol acquisition by 18 cerebral palsied children over a 3-year period. The report indicated that the children increased their use of symbols for communication and the range of people with whom they communicated, but insufficient data are given on subject characteristics and on the number and type of symbols learned. Harris-Vanderheiden, Brown, MacKenzie, Reinen and Scheibel (1975) successfully implemented Blissymbols as an alternative communication system for 5 severely and profoundly mentally handicapped cerebral palsied children. Only those children who were thought most likely to benefit from the programme and who were able to attend to tasks, to follow oral commands and to demonstrate motivation to communicate, were included in the programme. The children received 20 hours of training, which involved modelling and prompting of pointing responses to the symbols, symbol discrimination exercises, use of symbols for respondent communication, and elicitation of symbol pointing for expressive communication. Staff were also encouraged to use Bliss with the children outside of training sessions. Prior to training the children's expressive communication consisted of gross manual gestures and undifferentiated vocalizations. After training all 5 subjects showed some evidence of communicative use of symbols. There were, however, different levels of ability attained. Three subjects learned between 7 and 16 symbols, while 2 subjects acquired 50 and 75 symbols which they used in multi-symbol combinations. As a result, these latter 2 subjects were reclassified as educationally retarded. Overall, 3 of the subjects were said to use symbols spontaneously with different people and in different environments, while the remaining 2 subjects only used the symbols respondently. In 1979, Harris-Vanderheiden, Lippert, Yoder and Vanderheiden provided follow-up data on 3 of these children, who were in Bliss programmes for 41 months, and on 2 additional children who learned Blissymbolics for 30 months. Over these periods the children acquired between 60 and 200 symbols, using between 20 and 122 of the symbols spontaneously. Average length of symbol utterance produced rose from 1.00 to 4.00 for 2 of the children, and from 1.00 to 3.00 for the remaining 3 children. This study thus provides evidence that severely and profoundly retarded children can learn to use Bliss; in the 41-month programme the profoundly handicapped child was said to use 36 symbols, and the 2 severely handicapped children 140 and 180 symbols. This is the only report to date to provide long term follow-up information on a group of Bliss users. Unfortunately, the report gives minimal information on spontaneous symbol use, and presents no details of the methodology used to evaluate spontaneous use and number of symbols known.

Since Harris-Vanderheiden et al.'s study (1975; Harris-Vanderheiden et al., 1979) only 8 further reports have appeared describing the teaching of Blissymbols to physically and/or mentally handicapped individuals. Song (1979) taught Blissymbols to 4 mentally handicapped youngsters, 3 of whom were cerebral palsied, over a period of 10½ months. One subject dropped out of the programme due to physical difficulties in indicating symbols, while the remaining 2 subjects learned to understand between 20 and 46 symbols, and used between 3 and 31 symbols spontaneously. Song found wide variation in the number of symbols acquired and used by the subjects, who had essentially the same ability levels; but little information is actually provided on subject characteristics and progress. She further points out that by the time of writing the report only 1 subject was continuing to rely on Bliss for communication; the other 2 subjects were being taught ASL. No explanation is offered for this change. Elder and Bergman (1978) and Galloway (1978) both reported that profoundly to mildly mentally handicapped cerebral palsied children learned to identify

Blissymbols and showed good retention of symbols over time, but again very little detail is provided. This criticism is also applicable to Bailey and Hammond's (1978) anecdotal account of the progress of 2 nonverbal cerebral palsied children who were introduced to Bliss at approximately 7 years of age. By age 9½ they were said to be using 300 and 400 symbols respectively in spontaneous communication, although both tended to omit verbs and to use telegraphic utterances in their Bliss communications. James (1984) has presented some descriptive data on the spontaneous use of Blissymbols by 10 athetoid children of average intelligence over 4½ years of training. Overall, the children used an average of 52% of the symbols taught in spontaneous communication (between 135 and 205 of the 400 symbols available to them), with an average utterance length of 14.4 symbols. No information is given in the report on the criteria used to assess mean length of utterance, nor on how symbol utterances were recorded. From the examples of symbol utterances presented, it appears that mean length of symbol utterance was not calculated according to standard procedures and definitions (Brown, 1973), but rather was based on number of symbols used per communicative turn. Hughes (1979) provided an experimental evaluation of the ease of learning Blissymbols. Using 8 moderately and severely mentally handicapped children, he found that all subjects learned to identify symbols more rapidly than written words, thereby providing some evidence for the view that Blissymbols are easier to learn than written words. The final 2 studies both addressed the question of the generalization of Blissymbol use. Using a 14-year-old cerebral palsied subject, Welch and Pear (1980) compared pictures, photographs and real objects as training stimuli in order to determine which best facilitated generalization of naming responses (pointing to symbols) to real objects in the natural environment. No particular training stimulus mode was quicker than any other, but considerably more generalization was displayed to real objects in the natural environment when the child was trained with real objects than when either pictures or photographs were used. Kalimikerakis (1983) showed that a matrix design was an effective way of teaching symbols to 5 severely mentally handicapped children and resulted in some generalization of Blissymbols from trained to untrained symbols.

In addition to the above reports, questionnaire surveys of Blissymbol use have been conducted in the U.K. and America. Obviously survey data are unreliable as a means of assessing outcome measures, and these reports are thus at best only suggestive. McNaughton (1976b) surveyed 40 Bliss training programmes in the U.S.A. and Canada, covering 150 children who had been exposed to Bliss for periods ranging from under 6 months to over 2 years. The mean IQ of the children was in the mildly retarded range, with

15% of subjects being severely retarded, and 15% of average or above average IQ. Of all the children, 15% were said to be using 30 symbols or less, 67% were using under 200 symbols, and 20% were using over 400 symbols. Furthermore, 17% of subjects used single symbols only, 31% used 2 - or 3-symbol utterances and 17% used multi-symbol sentences. Information was missing for 34% of subjects and Bliss was unsuccessful with 18 subjects, apparently because of learning problems and retardation. In Kiernan, Reid and Jones' (1982) survey of the use of sign and symbol systems in special schools in the U.K., 18% of Severely Educationally Subnormal (ESN(S)) children and 34% of Physically Handicapped (PH) children in symbol programmes lasting up to 6 months were able to use over 30 symbols. Children in programmes of over 12 months duration were reported to use many more symbols. Of all children surveyed, 48% of ESN(S) children and 41% of PH children using symbol systems (mostly Blissymbolics) used only single symbol utterances; 17% of ESN(S) children and 18% of PH children used more than 2 symbols per utterance. Furthermore, 52% of ESN(S) children and 77% of PH children were able to answer questions using symbols, but only 8% of ESN(S) and 39% of PH children used the symbols to initiate conversations.

There appear to be no reported studies on the use of Blissymbols with autistic individuals, but 2 reports have examined the use of Bliss with individuals with acquired speech loss. Saya (1980) taught Bliss to 10 adult aphasics who had shown no improvement after at least 3 months of conventional speech therapy. After 2 months of daily training sessions, 5 subjects acquired between 27 and 41 symbols, while the remaining 5 subjects acquired between 2 and 25 symbols. However, none of the subjects used the system functionally in everyday situations, and 2 of the subjects rejected Bliss as a communication system altogether. Greater success was achieved by Ross (1979), who taught Blissymbols to an 18-year-old girl who had suffered severe brain damage following a road traffic accident. While the subject's general intellectual status was largely preserved and receptive language had greatly recovered, severe neuromotor impairment precluded the recovery of expressive speech. The introduction of Bliss was said to speed up the girl's communication and allow for effective self expression using complex sentence structures, but no quantitative data are offered to back these claims.

The crucial question of parental attitudes to Blissymbolics and their willingness to use Bliss with their language impaired children, has received scant attention in the research literature. Tew, Davies and Fletcher (1980) describe the results of a questionnaire survey sent to schools concerning parental attitudes to Bliss. Most parents (66.7%) were reported as having favourable attitudes to Bliss, citing the improved opportunities for communication afforded by the system. A smaller percentage of parents (16.7%) were said to express qualified support for Bliss. It must, however, be pointed out that parent attitudes were not sampled directly in this study. Instead, the authors relied on indirect reports from the schools about parent attitudes. This is also the case in Kiernan, Reid and Jones' (1982) survey, which indicated that 88% of physically handicapped children in symbol programmes, but only 59% of severely mentally handicapped children in symbol programmes, used the augmentative system with their mothers. The figures for use of the systems with fathers were considerably lower.

Overall, the reports and surveys reviewed above tend to suggest that Blissymbols can be effectively implemented as an augmentative means of communication for physically and mentally handicapped individuals. However, the poor quality of reporting in most of these studies, and the fact that they are so few in number, limits the conclusions that can be drawn about the efficacy and potential of Blissymbolics as an augmentative communication system. More recently, a small number of studies have begun to give attention to the question of how Bliss is actually used in natural conversational environments (e.g. Harris, 1982). The findings of these studies will be discussed in a later chapter.

9.2 Research Into Adaptations of Premack's Abstract Symbol Programme

Adaptations of Premack's 'plastic language' (1970, 1971) and the programme developed for teaching it have been used with several populations of language impaired persons, including mentally handicapped, autistic and aphasic individuals. However, as has been pointed out by Silverman (1980), these programmes have not been taught in most instances to provide a symbol system for communication, but rather to provide an introduction to the strategies involved in using symbol systems or languages. It is assumed that learning this symbol system will facilitate the acquisition of other symbol systems, notably speech.

Carrier (1974 ;Carrier and Peak, 1975) adapted Premack's language system for nonverbal mentally handicapped children, and developed the Non-Speech Language Initiation Program (Non-SLIP), which incorporates a set of plastic symbols, a simple set of grammatical rules and a limited vocabulary of words. Non-SLIP aims to teach syntactic forms in a highly structured programme. Carrier (1976) reported on 180 children who went through the programme. Many of the children were severely or profoundly mentally handicapped. Nearly all were said to be nonverbal at the onset of training, and many had had a history of failure in speech and language therapy. Details of subject characteristics presented in the report are, however, limited. Speech was included in the training of 57 children, 56 of whom moved on to conventional speech therapy. Only 3 of the 180 children failed to progress beyond the early phases of training. Deich and Hodges (1977, 1982) and Hodges and Deich (1978, 1979) report on the use of Premack-type symbols in two studies, the first a 4-month pilot study involving 8 moderately to profoundly handicapped nonverbal children, and the second a larger, ongoing study with low functioning as well as higher-IQ children. Subject characteristics seem to have varied widely, but little detail of these is given in the reports. Two of the children in the pilot study learned only a few nouns, while the other 6 reached at least the verb stage. In the larger study, too, outcome was very variable, with the low functioning group learning a mean of 7 symbols after 4 months training. The higher ability children (with M.A.s above 5 years) were said to have progressed at a much faster rate and to have reached the stage of using the symbols to produce complex sentences. Hodges and Deich stressed that even children with M.A.s of below 2 years were responding to the programme, although their progress was very slow.

More recently, Porter and Schroeder (1980) reported on the progress of 69 children who participated in their Non-SLIP programme over a 3-year period. The subjects were aged 3 to 19 years, and ranged in intelligence from normal to severely mentally handicapped, with a variety of organic handicaps. Thirty eight subjects dropped out of the study, mostly because they were transferred to other programmes. The remaining 31 subjects completed the programme and showed improvements on items specifically trained, and also on items not specifically trained, for example on tasks of number and colour matching, and on spoken language. A 3-year follow up of 9 of the children showed continued maintenance of skills taught with Non-SLIP, and great improvement in some subjects on other measures. By contrast, only 4 of the 18 severely mentally handicapped children (some of whom were also autistic) trained by Remington, Light and Porter (1981) gave evidence of learning the relations between symbols and objects. These authors, too, used abstract plastic symbols corresponding to everyday objects; but despite using large numbers of trials, they failed to replicate the earlier successes in training plastic symbol use. A possible explanation for this failure may be the absence of speech in the training programme used by Remington et al. The three earlier programmes had all used speech overtly during training, so that their subjects may have been encouraged to use prior verbal abilities to mediate the associations between symbols and objects.

There are only a few studies on the use of symbol systems with autistic children, and all are based on adaptations of Premack's 'plastic language'. McLean and McLean (1974) successfully trained 2 of 3 mute autistic boys to a criterion of 6 3-element sentences using plastic chips. Premack and Premack (1974) taught a mentally handicapped mute autistic boy to form sentences and use pluralization with the plastic symbols, and this was found to help the child to use pluralization in spoken language. DeVilliers and Naughton's (1974) 2 autistic subjects similarly learned to match symbols to a variety of objects and persons, and to construct and respond to simple phrases. Progress was slow, but this may have been due in part to the limited time devoted to training, which averaged only 15 minutes per week. Light and Remington (1978) taught 7 mentally handicapped autistic children to use different action symbols, to follow directions given in symbols, and to use negation and interrogatives. Three subjects failed to reach criterion on the first steps, and only 2 children completed the programme. Overall, these studies show that some autistic children can learn to use abstract symbols and syntactic structures, though with large variation in the progress achieved.

There is a small series of studies using adaptations of Premack's methods with aphasic individuals. Glass, Gazzaniga and Premack (1973) and Gardner, Zurif, Berry and Baker (1976) used arbitrary geometric designs to represent concepts, with specific syntactic notions being conveyed through the linear ordering of the symbols. Although few quantitative data are given, the range in performance appears to be quite marked. Of Glass et al.'s 7 adult global aphasic subjects, one subject mastered only the same-different notion, whereas 2 other subjects learned to produce multi-symbol utterances organized to convey Subject-Verb-Object information. Similarly, of Gardner et al.'s 15 aphasic subjects, 3 dropped out, a further 3 were unable to master the system, 4 were still in training at the time of writing, while the remaining 5 subjects completed the programme. These latter subjects all had IQs within the normal range, and after some 5 weeks of training all were able to use the system to respond to questions and commands and to describe actions. Spontaneous use of the system was shown by 2 subjects. Carrier and Peak (1975) briefly describe the use of the Non-SLIP programme with 3 adult aphasics, all of whom made progress. Finally, Hughes (1974/5) employed the Premack symbols and training procedures with 4 aphasic children with normal nonverbal IQs who were also learning signs. Again, few quantitative data are presented, but all the children were said to have acquired words, sentences and class concept functions, and also to have attained some competence in negation and question forms.

Overall, these studies indicate that some aphasic individuals with severe speech impairment can learn to utilize various language functions in an alternative symbol system.

As Kiernan, Reid and Jones (1982) point out, the studies using abstract symbol systems are valuable for their explicitness of programming and the fact that they show that at least some speech impaired individuals can be successfully taught to use syntactic structures in controlled situations. However, none of the studies show the system to be a functional language with creative use of symbols or generalization of symbol use to the student's everyday environment. Bonvillian and Nelson (1982) further question whether the continued use of arbitrary geometric symbols in training is at all justified. The use of representational symbols as opposed to abstract Premack-type symbols is more appropriate, and is more likely to foster rapid acquisition and communicative use of the symbols.

9.3 Studies Using Traditional Orthography

Word and letter boards have been used for many years with motorically impaired dysarthric individuals having high intellectual and language-functioning abilities (Feallock, 1958; Goldberg and Fenton, 1960; Kladde, 1974; McDonald and Schultz, 1973; Sayre, 1963; Vicker, 1974; Wendt, Sprague and Marquis, 1975). These reports are largely anecdotal, and most describe a developmental progression, beginning with the use of pictures and progressing to words and letters. Feallock (1958), for example, described the introduction of communication charts to 12 cerebral palsied children with little or no functional speech, whose intellectual abilities ranged from mentally handicapped to average. Half of the children made no progress in the use of the boards, in most cases because of unreliable word recognition skills and absence of adequate indication ability. However the remaining 6 children were said to use the word or letter boards effectively. McDonald and Schultz (1973) introduced a picture board to a nonverbal athetoid child of above average intelligence. At a later stage phrases, words and the alphabet were introduced, and syntactic rules were taught.

The ability of some autistic individuals to use the written word well beyond their ability to use speech, suggests that traditional orthography could be used with such children as an augmentative communication mode. Marshall and Hegrenes (1972), Ratusnik and Ratusnik (1974) and La Vigna (1977) all used traditional orthography with autistic children. La Vigna, and Marshall and Hegrenes, successfully taught 4 nonverbal autistic children to respond appropriately to a small number of word cards. Marshall and Hegrenes then proceeded to teach their subject to generate grammatical sentences to request food using the word cards. Ratusnik and Ratusnik taught their subject to spell out individual words with plastic letters, and then to combine the words in correct English sentences. At the conclusion of this study the child would occasionally use spontaneous word combinations to volunteer information and express needs and desires.

Unfortunately, the use of spelling boards is extremely slow, while the limited vocabulary and concept choices afforded by word boards are likely to prove inadequate for individuals with intact language systems. Beukelman and Yorkston (1977, 1980) attempted to maximize the communicative efficiency of 2 severely dysarthric individuals by investigating the effect on production rate and message intelligibility of a letter board used in combination with limited speech. They found that the subject's communication was fastest using speech alone, but was largely unintelligible. The use of a letter board (to point to the first letter of a word) while simultaneously uttering the word, markedly improved intelligibility. Further, this approach was faster than spelling out each word on the letter board.

9.4 Research Into the Use of Pictorial Systems of Communication

As indicated above, traditional orthography, Premack-type symbols and even Blissymbols are sometimes of limited efficacy when used with low functioning children. As a result, a number of researchers have recently attempted to develop communication means more suited to persons of low mental age, using highly iconic pictorial systems (Smeets and Lancioni, 1983).

Murphy, Steele, Gilligan et al.(1977) and Lancioni (1983) taught pictorial representations to 4 low functioning children, 3 of whom were autistic, after failure to teach them manual signs. Murphy et al.'s subject rapidly acquired expression and comprehension of 13 pictorial representations of objects, and learned to use 5 of the pictures to ask for objects he wanted. Lancioni's 3 subjects were exposed to a highly elaborate and intensive training programme over some 4 months, involving discrimination of objects in response to pictures, discrimination of body positions, and selection of pictures representing activities to be performed. The children were able to discriminate and select pictures within this highly structured programme, but the programme did not go as far as training and achieving functional use of the pictures outside of training sessions. Detamore and Lippke (1980), too, successfully used communication and picture boards with mentally handicapped children who were unable to learn both speech and manual signing. Murphy et al. speculate that level of symbolic abstraction was the main reason for the success of the pictorial mode - pictures being more directly representative of objects than are manual signs. The permanence of pictures, and their reliance on recognition rather than recall, may also have been relevant in this regard.

Reid and Hurlbut (1977), Smith and Murphy (1978) and Roodenburg and Smeets (1980) successfully trained a total of 8 multiply handicapped individuals to indicate pictures or rebuses on communication boards in response to objects, verbal labels and/or questions. One child in Smith and Murphy's report advanced to the stage of using combinations of rebus symbols to communicate. Reid and Hurlbut, and Roodenburg and Smeets, further showed that strangers were unable to interpret the subjects' communicative efforts when the latter used their own idiosyncratic methods of communication, but they correctly identified the subjects' communicative attempts when these were indicated on the picture boards. Finally, Jones (1979) introduced rebuses to autistic and severely mentally handicapped children, but he presents no quantitative data on the progress of his subjects.

9.5 Instructional Considerations in Symbol System Training

The studies reviewed above have, on the whole, reported some degree of success in teaching symbols to mentally handicapped, physically handicapped, autistic and aphasic individuals. However, these studies are all subject to methodological and reporting inadequacies, and they show wide variability in reported outcomes. Moreover, they are still too few in number to allow any firm conclusions to be drawn about the value of particular symbol systems as effective modes of augmentative or alternative communication.

There are many questions which still await investigation. The complex issue of optimal method of symbol instruction, for example, has received hardly any attention in the experimental literature. Few studies have compared different symbol training strategies systematically. The study by Remington, Light and Porter (1981) is an exception, having compared two methods of teaching arbitrary symbol - referent relations to a group of severely mentally handicapped nonverbal children, some of whom were also autistic. These authors found a small but significant difference in favour of a forced choice method of training, where other irrelevant symbols were present and correct responding was prompted, compared with a no-choice condition where only the correct choice of symbol was available. Another crucial issue which has received little attention concerns the question of which symbol forms may be easiest to learn (Kiernan, 1983c).

Hughes (1979) showed that Blissymbols were easier for mentally handicapped students to learn than written nonsense words. It also appeared that the discriminability of the symbols which were being presented together was of more importance in learning the symbols than the relative complexity of a symbol. Kuntz, Carrier and Hollis (1978) found that mentally handicapped children learned to use pictorial Rebus symbols more readily than Premack-type abstract symbols, although transfer to traditional orthography was slower with the more pictographic system. In a more recent study, Meador (1984) investigated ways in which the manipulation of stimulus characteristics may facilitate symbol discrimination learning by mentally handicapped individuals. She found that redundant colour cues on the backgrounds of lexigrams did not facilitate the visual discrimination of the lexigrams, but that the random assignment of colour to the lexigrams themselves did facilitate their discrimination. Distinctive-feature training, in which colour was assigned only to the distinctive elements of lexigrams, was even more effective and facilitated visual discriminations among highly similar symbols.

There remains an urgent need for the further development and evaluation of instructional media for the training of augmentative symbol system use.

Chapter 10. Explanations Proposed for the Effectiveness of Augmentative Systems of Communication

As can be seen from the studies reviewed in the preceding two chapters, a wide range of language impaired individuals have benefitted from the introduction of sign and symbol communication systems. A variety of reasons have been proposed to account for the relative success of the augmentative systems in fostering communicative skills, when approaches emphasizing speech have often repeatedly failed. Obviously, in cases where the failure to develop speech is due to motor abnormalities of the speech musculature, the use of signs or symbols side-steps these difficulties. But where the failure to develop speech occurs in the context of autism or mental handicap, other explanations must be sought.

The optimising of learning conditions in the form of carefully designed and structured sign/symbol teaching programmes is undoubtedly one important contributory factor. Fristoe and Lloyd (1979) and Lloyd and Karlan (1984) further point out that the information presented to the individual, when presented in a non-speech form, is simplified in both context and manner of presentation, which is likely to facilitate processing and hence understanding of the communicative messages. This is accomplished in a number of ways. In the first place verbiage is reduced. When speech and augmentative signs/symbols are simultaneously presented, irrelevant or parenthetical comments are likely to be eliminated from the trainer's speech. Secondly, the structure of language input is likely to be simplified. When non-speech symbols are presented with speech, the full syntactic structure of the spoken message is often not represented by the signs or symbols. The non-speech symbols often represent only the semantically relevant information in the message. This highlights what is critical to be comprehended and results in considerable economy of memory loading. Thirdly, the vocabulary of signs/symbols taught tends to be small and more broadly functional to the learner. In this way conceptual rather than syntactic learning is emphasized. Finally, when signs or symbols are presented simultaneously with speech, the rate of presentation is slowed, allowing more processing time and therefore improved comprehension.

Bonvillian and Nelson (1978), Lloyd and Karlan (1984), Schaeffer (1978) and others point to another advantage present in training methods, namely the relative ease with which individual signs can be taught. Whereas the tongue and vocal cords cannot be physically manipulated, the student's hands can be directly moulded and led through the correct movement sequences of signs, or guided to indicate particular symbols. The direct and immediate feedback to the student that moulding and prompting allow makes signs easier to learn than sounds. A related issue here concerns the visibility of signs. Students are able to see the shape and movement of the teacher's hands and of their own hands; and the two sets of hands can be held together to determine the similarity (Wilbur, 1976). This feature also has two distinct advantages for the trainer. In the first place, he/she can make a much better judgement in the visual-manual modality of the learner's success in achieving successive approximations than is possible in the auditory-vocal modality. Secondly, with visually presented and produced signs/symbols, evaluation and hence maintenance of attention can be achieved through the assessment of direction of gaze. Visible evaluation of attention to auditory stimuli is more difficult. Unlike speech sounds, manual signs can also be held for relatively long periods of time, thereby providing individuals with a continuously available model or prompt for their response. The increased temporal duration of the presentation of signs, and-to an even greater extent - of symbols, is valuable for individuals for whom greater orientation,perception and processing time for stimulus presentations is required. Symbol systems, because they are permanent and continuously visible, have an added advantage in that the learner is required only to recognize the symbol he wishes to select, rather than having to recall and execute a given word or sign.

Kiernan, Jordan and Saunders (1978) point to the pattern of normal development as offering added clues to the success of signing with many children. Piaget has argued that speech develops from internalised action and that gesture - the part representation of the action - may predate speech. So in learning a new concept, the child learns the relevant physical response and, in internalising it, attaches the words to the action sequence. This points to action-related signs as a possible means of communicating more basic than speech. Augmentative systems of communication can be seen as picking up on such primitive means of communication as gesture and pointing, and exploiting them (Kiernan, 1982). Schaeffer (1980b) argues that spontaneous signing develops primarily out of the goal directedness of normal hand movements. Severely language impaired children use their hands to attain physical goals such as grasping or pushing away objects, just as normal infants do. Thus they know the relation between hand movements and fulfilment of desires and they know that hand movements must be adjusted to fit the desire. Schaeffer hypothesizes that they learn to sign spontaneously by adapting the goal-directed hand movements they use for grasping to the attainment of social goals, and that this step is easier than the step from goal-directed hand movements to the spontaneous use of words. At a purely motor level, too, the motor acts required for symbol indication, and even for sign production, are far less complex than those required for phonation and articulation. Evidence that children of deaf parents begin to use signs and sign combinations at earlier ages than hearing children of hearing parents use speech (e.g. Schlesinger and Meadow, 1972) would tend to confirm that signs are motorically simpler to learn than speech.

Fristoe and Lloyd (1979) further make note of the unimodal rather than crossmodal relationship which exists between signs/symbols and visual referents. They suggest that signs and symbols, being visual in modality, are more easily associated with visual referents than are speech symbols, which exist in a different modality. The fact that many signs and symbols are iconic, in that they resemble the actions or objects for which they stand, as opposed to the largely arbitrary relationship between a spoken word and its referent, has been cited by many writers as one possible explanation of the relative ease of learning augmentative systems (e.g. Brown, 1977; Kahn, 1981; Lancioni, Smeets and Oliva, 1984). Although iconicity is not an essential aspect, and many noniconic signs are learned, there is some evidence that iconic signs and symbols are easier to learn and remember (e.g. Brown, 1977; Konstantareas, Oxman and Webster, 1978; Kuntz, Carrier and Hollis, 1978).

Further advantages to using a visual-motor system of communication, particularly relevant to autistic and mentally handicapped children, stem from research by Hermelin and O'Connor (1970), and others, who found that these children have a perceptual disparity that favours the visual-tactile mode over the auditory. By their visual modality, augmentative systems by-pass the auditory channel and any auditory processing deficits that may exist, while taking advantage of underlying skills that are relatively unimpaired (visual and kinesthetic). Many writers have gone further and argued that the use of simultaneous communication, in which visual and auditory stimuli are paired, is to be encouraged - firstly since it gives the student the benefit of the stronger channel while continuing to stimulate the weaker one, and secondly because of the richer teaching environment and cue redundancy thereby provided. The student has two sources of information using two different sensory channels on which to rely, allowing him/her to make up in one mode what may have been poorly processed or remembered in the other (Konstantareas and Leibovitz, 1981; Schaeffer, 1980a). Simultaneous instruction in two modes may also stimulate the language-deficient individual to allot more of his limited attentional capacities to the task of communicating. Brady and Smouse (1978) and Barrera, Lobato-Barrera and Sulzer-Azaroff (1980) both found greater success with total communication training when compared with purely oral or purely manual training, and argued that this improved performance resulted from the additional visual, tactile and kinesthetic cues intrinsic to the model. On the other hand, Bryson (1972) found autistic children to be poor at cross-modal association tasks, while Lovaas, Schreibman, Koegel and Rhem (1971) and others have shown that when presented with multimodal stimuli, autistic children tend to show stimulus overselectivity, focusing on only one feature or modality to the exclusion of others, and with different children displaying different modality or feature preferences. This would suggest that the provision of multiple stimuli as in simultaneous communication, may in fact reduce the rate of learning, and that many autistic children would perform equally well, or better, when either signs or speech are presented alone. Kiernan (1983a) suggests that what may be the case is that when a child can respond to both sign and speech, both are processed equally well in reception of signals, and speech and sign potentiate each other in expressive learning. When the child is mute he/she tends to respond poorly to speech, and would benefit more from purely manual training.

A final factor that has been proposed to account for the facilitation function of augmentative systems on communicative development relates to motivational and attitudinal issues. As Kiernan, Jordan and Saunders (1978) point out, it may be that teachers are better motivated when they teach signs or symbols, because these systems are new and fashionable. Similarly, it may be that the child is enthused by a novel mode of teaching, and one not directly associated with the prior failures and frustrations of speech communication attempts. Moreover, pressure for speech exerted by parents and teachers, which becomes detrimental to further development of communication attempts, is removed, and this may further help to increase the motivation to learn language (Lloyd and Karlan, 1984).

The exact role and relative contribution of each of the above factors for the facilitation of communication development has yet to be fully established through empirical investigation. As Lloyd and Karlan (1984) point out, establishing the relative contributions of or the relationship among these factors would greatly clarify the direction that could be taken in developing techniques that would fully exploit the advantages provided by the factors contributing the most facilitative effects.

Chapter 11. Linguistic and Functional Aspects of Sign/Symbol Use

As was described in Chapter 5.3, the natural sign languages have their own morphology, syntax and semantics, which deviate substantially from English. Whereas in English, grammatical relations and modifications of lexical items are signalled largely by word order and by appended inflections, in visual-spatial languages like ASL and BSL relations among signs and grammatical modifications are stipulated primarily by manipulation of points in space and by such paralinguistic features as body and facial movement (Bellugi and Klima, 1984). In the case of Blissymbolics, too, Charles Bliss (1965) developed a syntax for symbol use in which functors are omitted and in which some of the structural forms employ word orders that are different from those used in English. However, surveys of the use of augmentative systems with language impaired individuals indicate that the systems are typically used simultaneously with spoken English, and that the syntax of the signs and symbols is modified to fit the structure of English (Fristoe and Lloyd, 1978; Goodman, Wilson and Bornstein, 1978; Kiernan, Reid and Jones, 1982). Thus ASL or BSL signs are used following spoken English word order, often with additional signs devised to signify tense endings and other parts of speech 'missing' from sign languages of the deaf. In other cases, contrived sign systems such as the PGSS are used, which mirror spoken English syntax. Blissymbolics, too, is made compatible with the linguistic structure of spoken English by using symbols representing function as well as content words, by following English word order, and by using special symbols to indicate morphological variations.

In view of the above, a critical research area concerns whether the developed communicative use of signs and symbols is analogous to the use of the oral expressive mode in terms of syntactic, semantic and pragmatic developmental processes. There is considerable controversy as to whether the acquisition of syntax or semantics in spoken language is the same for handicapped children as it is for normal children. Leonard (1972), for example, argues that morpheme acquisition in language-delayed verbal children follows a normal pattern but is achieved at higher levels of mean length of utterance than is the case for normals. In contrast, other studies with deaf, mentally handicapped and language-delayed children seem to indicate atypical patterns of rule acquisition (e.g. Menyuk, 1969). Such issues must also be examined in the case of sign and symbol language acquisition. Unfortunately, augmentative training research studies have typically focused almost exclusively on the assessment of the numbers of symbols or signs learned. It is only recently that attention has begun to be given to the syntactic and semantic form of sign/symbol communication, and to the question of how augmentative systems are actually used in natural conversational environments (Kraat, 1984). Such research is clearly of great value in highlighting similarities and differences between speech and augmentative system acquisition, and in providing a basis on which future programme development can be based (Kiernan, 1981b).

Lambert (1978) analysed signed samples of 16 language disordered children linguistically, using the LARSP procedure (Crystal, Fletcher and Garman, 1976). Despite the fact that the children were taught PGSS, which follows English word order, she found deviations in the form of omissions, additions, substitutions of the wrong sign, and many instances of word order errors. Lambert concluded that the parameters for determining sign order are different from those for spoken language; they are nonlinguistic and include factors like chronological order of events, the visual order of the situation, and emotional factors such as expressing the most important event first. Semantic relationships thus seem to be much more important in determining sign order than are syntactic relations. Lambert argues that this stems from the visual dominance of the signing medium, in which it is possible to argue that information is more likely to be derived from spatial relationships than from time-based sequences which are important in verbal language. The children, and in particular those who were poor verbally, were thus using PGSS more like a natural sign language than a signed version of spoken English. Fenn and Rowe (1975), too, found many cases of deviation from English word order in the signed samples of 7 mentally handicapped cerebral palsied children who were taught PGSS. However, the meanings of utterances were mostly clear and the authors therefore proceeded to analyse the samples semantically rather than syntactically.

Fenn and Rowe's study was in fact one of the first to attempt semantic analysis of signed utterances. Expressive abilities were assessed through video-tape recordings of 20-minute sign conversations, and the authors indicate that most of the children were able to show all the semantic relations characteristic of Brown's (1973) first stage of normal speech, including entity-naming, negation, action-object, etc. Unfortunately, the study provides no information on the number of utterances produced, on their mean length of utterance, on the frequency of semantic category use, on pre-training assessment of functional communication, or on reliabilities for the scoring of signs. Bonvillian and Nelson (1976) analysed the early sign combinations of a 9-year-old boy using ASL, according to the semantic relations expressed. These authors, too, found that the boy's range of two-sign combinations closely resembled the range of two-word utterances produced by normal children (Brown, 1973); 68% of his utterances were either agent-action or experiencer-action combinations. Other constructions used included action-location, possessor-object and time-action. However, the boy's subsequent sign combinations over the following 2½ years did not keep pace in terms of their average length and complexity with those reported for normal children, and most utterances remained 2 or 3 signs in length (Bonvillian and Nelson, 1978). In the only other study to report systematically on the early semantic development of signed utterances, Layton and Baker (1981) analysed signed samples of an 8-year-old-autistic boy taught ASL and speech over 1½ years, using slightly different semantic categories. As was found by Bonvillian and Nelson, and (for normal children) by Bloom, Lightbown and Hood (1975), the action category was produced most frequently (e.g. action-object, agent-action), followed by the state category (experiencer-state, benefactive-state/action-object). Other categories used included possession-possessed and attribution. Again, however, although the subject's syntactic-semantic growth was shown to progress somewhat normally, Layton and Baker point to a number of differences from normal language development; overall the child produced <u>many</u> fewer signed utterances than is the case for normal children, and while a variety of semantic relations were expressed at least once, multi-sign utterances were mostly restricted to only a few semantic categories. Anecdotal reports of syntactic and semantic development in sign use in other reports include observations of the occurrence of imperative, interrogative, declarative and compound sign sentences (Creedon, 1973), and verb-object and subject-verb-object combinations (Fulwiler and Fouts, 1976).

In sum, then, it seems that while sign users tend generally to follow the normal semantic-syntactic sequence of early language development, and some learn to use rather complex sign combinations, they may well lack many of the linguistic skills of younger normal children, be it in terms of quantity or complexity of utterances produced, or range of semantic content (Bonvillian and Nelson, 1978; Layton and Baker, 1981). This conclusion, if confirmed by future studies, will be in line with Leonard's (1972) findings on speaking language disordered children, who tended to follow the normal sequence of language development but needed to be at higher linguistic levels than normal children before specific linguistic skills were used with any degree of consistency.

On the question of the functional use of signs, there are a number of anecdotal reports of individuals using their signs to communicate effectively, but there is a lack of detailed records of the communicative process. Many reports mention use of signing to request actions or objects (e.g. Miller and Miller, 1973; Salvin, Routh, Foster and Lovejoy, 1977; Schaeffer, 1980b). Descriptive uses of sign utterances are also reported (Carr and Kologinsky, 1983). Creedon (1973) and Konstantareas, Webster and Oxman (1979) note use of signing by their autistic subjects for labelling, expression of feeling states, making requests, description of actions, possession and location, and social greeting; however, Konstantareas et al note that not all children employed all these categories, and that labelling and making requests were the most common categories used. In another anecdotal report, Konstantareas, Hunter and Sloman (1982) examined a blind autistic child's sign utterances in terms of Halliday's (1975) 7 categories of sociolinguistic development. The subject's sign utterances were said to be restricted almost exclusively to the Regulatory ("Do as I tell you") and Instrumental ("I want") functions of language. None of the remaining categories - the Interpersonal, Personal, Heuristic, Imaginative and Informative - were clearly represented. In the only systematic report of sign use published to date, Oxman and Blake (1980) used these same categories to examine the communicative functions expressed in the signed utterances of 10 autistic children who participated in 4 30-minute play sessions with familiar and unfamiliar adults. They found that the pragmatic function of Informative (language used to convey information) accounted for 63% of non-imitative signed utterances, followed by the Instrumental function. The Regulatory, Interpersonal and Personal functions occurred with the least frequency. Oxman and Blake further noted that many of the children's signed utterances were responses to direct questions rather than spontaneously produced, that approximately half the utterances were imitative, and that more utterances, and more spontaneous utterances, were produced with the familiar than the unfamiliar adults. Finally, in a brief preliminary report of the functional use of signs by 3 mentally handicapped adults in a controlled setting, Clibbens, Fawcett and Sweetman (1983) found evidence of the use of Requestives, Assertives, Regulatives, Exclamations, Performatives and Responsives. These reports demonstrate the ability of sign users, including autistic children, to use signs to express a variety of communicative functions. The predominance of Instrumental/Requesting and Labelling functions reported by some investigators may well reflect teaching methods or the initial stages of acquisition of communicative skills (Kiernan , 1983a).

Turning to the literature on symbol systems, apart from the studies using Premack-type symbols, which taught syntactic structures in a series of pre-arranged steps and were not concerned with generalization to natural settings (e.g. Carrier, 1976), there is to date only one published study which has examined syntactic aspects of symbol production. House, Hanley and Magid (1980) taught 10 trainable mentally handicapped adults to use manipulable logographic symbols to describe pictures. They found that 4 of the 5 subjects who could produce correct 4-symbol sentences, did so in 2 distinct stages. First, the correct symbols were chosen, not however in sentence order; then the symbols were arranged in their correct order. The symbols were not however chosen randomly; either the subject or the object of the sentence was chosen first, followed by the verb, and then the preposition. House et al suggest that the order of choice was determined partly by salience; the semantic aspects of the sentence were disengaged from the syntactic aspects, the first stage being controlled by meaning alone, and the second involving the application of syntactic rules. House et al point out that this method, although inefficient in some ways, put less strain on central processing capacity. They also note that the difficulties in producing the correct word order may suggest that symbol users may have difficulty in producing correct word order using communication boards with <u>fixed</u> elements. There are, however, no other relevant studies to confirm or refute this hypothesis, and no analyses of the semantic relations expressed in symbol utterances.

There is also very little research which describes the nature of communicative interaction among symbol users or between symbol users and speaking persons. In one such valuable study, Harris (1982) investigated classroom communicative interactions between teachers and 3 nonverbal cerebral palsied children who were using an electronic display device (the Auto-com). Harris found that in all contexts communicative interactions were dominated by the teachers, who contributed substantially more information per communicative turn than did the children. The teachers primarily initiated interactions, whereas the children used their boards in a predominantly respondent manner, and their messages consisted mostly of 1-word responses. The children rarely interacted with peers or adults other than their teachers. Harris further found that adults rarely initiated interactions with the children unless they wanted specific information. General interest conversations seldom occurred, and the children were seldom allowed sufficient time to express more than 1-unit responses. These interaction processes resulted in the children initiating very few communicative exchanges themselves. When they did initiate communication, the children primarily used gestures, pointing and vocalizations (rather than their communication boards), presumably because these modes, although more likely to be ambiguous, created the greatest visual or auditory attention, were most accessible, required the least amount of physical effort, and resulted in faster message transmission. Harris also examined the communicative functions expressed, and found that the children almost exclusively expressed responses to teachers' questions or instructions. A primary reason for this may be that physically handicapped children are not often afforded the opportunity to express language functions other than answers since most of their needs are provided for or guessed, and the child needs only to confirm or deny these. Speed of communication is also a factor. Responding to questions can be accomplished quickly by the child, whereas the expression of other communicative functions involves greater time and effort, and this may inhibit the symbol user. Unfortunately, Harris provides no quantitative data in her report to substantiate her conclusions.

The preponderance of such a passive role in communication by symbol users was confirmed by Lewis and Ripich (1984) and by Calculator and Dollaghan (1982). Calculator and Dollaghan observed interactions between teachers and 7 physically and mentally handicapped Blissymbol users who had used Bliss for 2 years. They found that the subjects occupied the respondent role nearly 3 times as frequently as the initiator role. The authors further found that teachers responded to 79% of the subjects' responses but to only 39% of the subjects' message initiations, and that 82% of subject responses were 'successful' (i.e. were followed by teacher acceptance rather than by requests for clarification, nonresponse or change of topic), compared with only 24% of student initiations being successful. This is clearly because when the teacher initiates the message, she/he is able to constrain the topic and complexity of the student's subsequent response, thus narrowing the range of possible interpretations involved in decoding the response and increasing the likelihood of message success. The fact that symbol users experience such lack of success in the initiating role may partly explain their low communication initiation rates. Like Harris, Calculator and Dollaghan also found that the subjects preferred to use non-Bliss modes such as gestures and pointing when producing messages, despite the fact that these alternate modalities had previously been judged sufficiently inadequate to warrant the use of Bliss. In spontaneous utterances, Bliss was used in only 11% of messages, and non-Bliss modes were used for 89% of messages; in the case of response utterances, the Blissymbols were used for only 21% of messages. Moreover use of the symbols was not found to increase the likelihood of student message success, nor to decrease the ambiguity of their messages, which might explain the reticence of students to use such communication systems in interactions. Alternatively, it may be that Bliss was ineffective <u>because</u> it was used so infrequently.

In sum, the few interaction studies that have been conducted on everyday use of augmentative systems present a rather depressing picture of poor system use and of few utterances produced during recording sessions, these being mostly one symbol long, and mostly responses. The verbal partner in interactions is described as being in a dominant role, controlling topic selection, the level and length of the interaction, and the degree of participation possible from the augmentative system user. Often a response is not expected from the nonverbal individual, and when communicative exchanges do occur, these are often characterized by questions from the verbal partner which require a limited response from the system user. Analyses of speech acts produced by augmentative system users show that some acts are absent, and there is an unusually high proportion of requests and information-giving in response to limited-response questions. Moreover, communication occurs mostly through modes other than the manual or symbol systems. System users thus appear primarily as respondents and passive partners, using their augmentative system very little (Kraat, 1984).

Typically the blame for this state of affairs has been put on the verbal partner for not providing enough time and opportunity for the augmentative communication user to participate in an interaction. However, Kraat (1982 , 1984; Yoder and Kraat, 1983) points to additional factors that also influence the nature and quality of augmentative system use. Characteristics of the systems themselves that lead to difficulties include their slow transmission rates and the limited available vocabulary. Symbol communication, and even manual signing, are significantly slower than speech (Foulds, 1980). As a consequence, the system user has difficulty in getting conversational entry, continuing a conversation beyond one utterance, and terminating it when he/she wishes. Because augmentative communication is exceedingly time consuming and often places burdens of interpretation, expansion and memory on the verbal partner, the partner is likely to limit conversation when it occurs and to reduce its frequency. Lengthy and elaborated communications are thus not encouraged. The faster vocal speakers are in a more powerful position to control the interaction and, in order to speed up the communication, they typically bombard the system user with yes/no questions, ask and answer their own questions, or expand the beginning of a response into what they think the nonspeaker wants to communicate. The slow rate of augmentative communication and the fact that it is often physically effortful for the system user may also partly explain the high proportion of requests and giving of information found in the communication samples; essential needs are likely to be communicated, and less salient communication may be left unsaid. The slow rate of communication further creates a need for efficiency, so that the user might produce an utterance in a telegraphic way, leaving out the syntactic and stylistic elements that are secondary to the message, because this is faster. In other cases gestures or vocalization are used instead of symbols or signs since they are faster and more effective, even though they could result in misunderstandings.

Also of importance is the presence of finite and restricted vocabulary sets that interfere with the effectiveness of communication. Whereas an 8-year-old speaker typically has thousands of words available to him/her, augmentative communicators may only have 20 or 200 vocabulary items available. Thus, nonspeakers are required to communicate with a restricted vocabulary set which is often well below their needs and abilities and will restrict their ability to use language in an extensive fashion. Many meanings and forms of expression are unavailable to them, which may be another reason for the rarity with which they initiate conversations. There is a growing recognition that the training procedures used are also partly to blame for poor interaction and system use (Kraat, 1984). Most training studies have focused on sign/symbol mastery, with the expectation that actual communicative use within the natural environment would occur automatically. It is now becoming clear that sign and symbol use needs to be actively trained. In this regard it is important to bear in mind that nonverbal persons typically bring to augmentative system use well established patterns of passivity, limited physical and cognitive experiences and poor motivation to communicate with others. These patterns themselves are likely to limit the interaction that occurs when an augmentative system is introduced, and special training strategies will be required to overcome them.

Chapter 12. Research Findings on Predictive Indicators of System Success

The studies reviewed in Chapters 8 and 9 indicate that augmentative communication training can be very effective in improving an individual's ability to communicate, but that the amount of such improvement is not a constant. Considerable variability has been observed both between and within studies in terms of the rate and breadth of vocabulary growth, the degree to which spontaneous and functional sign/symbol production occurs, and the use of signs or symbols in a combinatorial fashion. It would seem highly likely that individual variables within subjects are important in affecting outcome, and some of the factors thought by writers in the field to be relevant in this regard were discussed in Chapter 7.2. As Howlin (1979) points out, a key question is not so much <u>whether</u> language training works, but <u>for whom</u> it works. Unfortunately, the research literature to date is very inadequate in casting light on correlates of successful sign and symbol acquisition. The failure of the majority of studies to provide data on IQ level, initial language level, and other important variables, precludes attempts to analyse the possible role of such factors in affecting outcome, and variance in studies created by substantial individual differences and by different training methods makes any generalizations even more difficult (Kiernan, 1983b). The few studies which have attempted to take individual differences into account in response to training are reviewed in this chapter.

Intellectual abilities may be expected to have a significant effect on the rate and extent of sign and symbol acquisition. Sutherland and Beckett (1969) found overall correspondence between progress in sign learning and IQ, although one of the two subjects having the lowest scores was able to use signs in conversation, while the other could only imitate signs. Culatta and Blackstone (1980), Kahn (1981), Layton and

Helmer (1982) and Rittenhouse (1983) note that subjects classified as the most able intellectually (on assessment or as rated by teachers) achieved greatest success in learning to sign. Grinnell, Detamore and Lippke(1976), using subjects with a wide range of ability levels, found different outcomes by intelligence level: the severely mentally handicapped individuals acquired from 1 to 65 signs and made occasional 2- and 3-sign combinations; the trainable retarded acquired from 12 to 170 signs and learned to form some phrases and short sentences in sign;and the educable mentally handicapped acquired over 200 signs and used complex sign utterances. Of the symbol training studies, Porter and Schroeder (1980), Saya (1980) and Silverman, McNaughton and Kates (1978) found a strong association between performance and IQ, Sansone (1982) presented no data but claimed that individuals with mental ages of 5 to 7 years emerged as those who experienced the most success in utilizing Blissymbols. Similarly, Hodges and Deich (1979) found that the children with mental ages over 5 years made most progress in learning Premack-type abstract symbols, whereas children with mental ages between 1 and 2 years showed very slow learning rates. In general,there was a positive correlation between mental age and speed and amount learned, though with some exceptions.

In contrast to the above, many other studies have found no correlation between IQ and acquisition of receptive and expressive aspects of signs/ symbols. Kiernan (1977) computed correlations of 0.30 for sign expression & 0.12 for sign comprehension from the data of Cornforth, Johnson and Walker (1974), and Bonvillian and Nelson (1978) found a correlation of -0.11 with 'size of sign vocabulary'. Lambert (1978), Hobson and Duncan (1979), Daniloff and Shafer (1981), and Carr, Pridal and Dores (1984) also found no significant correlations between number of signs learned and IQ. Carrier (1976) claimed no relationship between the extent of mental handicap and progress in the Non-SLIP programme, although no supporting data are given.

Kiernan, Reid and Jones (1982) point to several problems in interpreting the IQ data. It is possible that students of low general intelligence, who are more likely to have difficulty, are given extra tuition, thereby confounding IQ effects. Moreover, most studies included limited IQ ranges, which would lower the correlations. It seems that at the extreme low end of the intelligence scales, the IQ tests are unable to accurately differentiate the performance capabilities needed to master signs/symbols (Bonvillian and Nelson, 1978). Indeed, most studies which found no relationship between IQ and sign/symbol mastery used severely and profoundly handicapped individuals. IQ scores appear to be better predictors of progress when a wider range of intelligence is involved (e.g. Grinnell, Detamore and Lippke, 1976; Silverman, McNaughton and Kates, 1978). In sum, then, the data so far published suggest a weak relationship with IQ , which is likely to have little predictive value (Kiernan, Reid and Jones, 1982). Other variables relating to acquisition thus need to be examined.

In the sign training studies, Layton and Helmer (1982) found tested language comprehension to be the best overall predictor of sign use, while Hobson and Duncan (1979) found initial word comprehension scores (on the Peabody Picture Vocabulary Scale) to correlate significantly with sign acquisition and retention. Similarly, Reid (1981) found better progress in children with better comprehension and symbolic play skills. On the other hand, Carr, Pridal and Dores (1984) found that language age was not predictive of performance in their study of receptive sign acquisition by autistic children, and Skelly (1979) found no correlations between the language measures used (including the Porch Index of Communicative Abilities) and success in the use of Amer-Ind. Motivation to communicate, described variously as 'prior interest in communicating' (Rittenhouse, 1983), 'the existence of intention to communicate' (Lombardino, Willems and MacDonald, 1981) and 'behaviours related to need satisfaction' (Reid and Kiernan, 1984), has, however, generally been found to be relevant to progress.

The use of gestures, or performance on gestural imitation tasks prior to training, is shown to be important in a number of studies. Kahn (1981) and Reid and Kiernan (1984) found a significant association between sign acquisition and scores on gestural imitation tasks, while Brockner and Murphy (1975), Linville (1977) and Hobson and Duncan (1979) all describe the presence of initial gestural ability in those subjects who achieved spontaneous sign production. Topper Zweiban (1977) found manual dexterity, as measured by the Manual Expression subtest of the Illinois Test of Psycholinguistic Abilities, to be a good indicator of success in sign acquisition. Interestingly, vocal imitation has also been shown to be an important predictor of sign acquisition (Layton and Helmer, 1982; Reid and Kiernan, 1984), which is not unexpected since both tasks require the subject to imitate or produce a stimulus provided by the trainer.

While Topper Zweiban (1977) and Kahn (1981) further noted a negative correlation between chronological age and acquisition and use of signs, no such correlation emerged in the studies of Daniloff and Shafer (1981), Hobson and Duncan (1979), Miller and Miller (1973; Kiernan, 1983a) and Walker (1973). In contrast, length of participation in training, and the number of signs acquired in the initial stages of training, have both been found to be positively correlated with long term progress in sign acquisition (Bonvillian and Nelson, 1978; Daniloff and Shafer, 1981; Hobson and Duncan, 1979; Kiernan, Reid and Jones, 1982; Miller and Miller, 1973). Among other variables that have been examined, Miller and Miller (1973) found a negative correlation between expressive use of sign and 'Creak' scores giving an indication of severity of autism. Walker (1973) found significant correlations between sign acquisition and socialization ability (based on the Gunzburg Progressive Assessment Charts), lip reading skills and natural gesture ability. However, most of her measures were 'ad hoc', with no information on their reliability and validity; moreover, Kiernan, Reid and Jones (1982) note that after partialling out confounding effects of pre-training measures, the correlation with socialization was considerably reduced. Topper Zweiban (1977) similarly found a weak correlation between sign acquisition and social maturity as measured on the Vineland Scale.

A similar picture to the above emerges from the studies which have examined correlates of successful symbol use. In Kiernan, Reid and Jones' survey (1982), children in longer training programmes were reported to use and understand more symbols than children in shorter programmes. Galloway (1978), Saya (1980), Song (1979) and Vicker (1974) found that the greatest progress in Blissymbol or word communication board use was achieved by subjects who were well motivated and made efforts to communicate even prior to training. However, few data are provided to substantiate these conclusions. Song added that word comprehension scores (on the Peabody Picture Vocabulary Test) were a good predictor of acquisition, but only for those students who also had a desire to communicate; and Remington, Light and Porter (1981) found performance on the Reynell Language Comprehension Scale to be predictive of abstract symbol acquisition. Scores on the verbal subtests of the Porch Index of Communicative Ability, on a language comprehension test and on visual matching and visual closure tasks were further found by Saya (1980) to distinguish her above average Blissymbol users; while Deich and Hodges (1982) found a positive correlation between language comprehension and attention, and acquisition of Premack-type abstract symbols. The report by Silverman, McNaughton and Kates (1978), covering 157 Blissymbol users, although providing insufficient detail of methodology and analysis, suggested that, apart from I Q, age was the most important variable relating to symbol use. The relevance of age, which interestingly was not indicated in the sign training studies, was also noted in Saya's (1980) Blissymbol acquisition study. Beyond age and IQ, the best predictors in Silverman et al's report were measures of existing progress, including number of symbols known and used, and number of settings in which symbols were used. Along similar lines, Song (1979) and Deich and Hodges (1982) found that the more rapidly symbols were acquired, the more likely they were to be retained and used spontaneously. The implication of these latter findings would seem to be that children should not be excluded from symbol programmes on pre-selection criteria, but rather that they could be 'tried' on a symbol system and their retention in teaching judged by their response to it (Kiernan, Reid and Jones, 1982).

In sum, several tentative claims can be made as to the factors related to achievement in augmentative communication use (Bonvillian and Nelson, 1982). More progress seems to be made when children are relatively young, and/or when programme participation is relatively lengthy (although age is unlikely to inhibit acquisition of signs/symbols). Various measures of ability prior to participation in training also appear to be related to sign/symbol mastery, including receptive language status, verbal and/or motor imitation ability, motivation to communicate, use of gesture, and (for autistic children) indices of autistic symptom severity. In contrast, measures of intelligence are not clearly predictive of progress. However, as Kiernan, Reid and Jones (1982) emphasize, there are as yet insufficient data to relate the results of standardized assessments to outcome with any degree of confidence. Different studies use different measures of language competence, with mixed results, and most use only a handful of subjects and are methodologically weak in terms of the assessment measures used, the data providea or statistical analyses undertaken. Furthermore, current I Q measures are, in the words of Bonvillian and Nelson (1982), nearly useless as predictors of achievement for severely mentally handicapped subjects. A final point to note is that a number of other variables which are likely to be important correlates of progress in sign/symbol use have typically been omitted from consideration in past studies. These include the extent of parental interest and cooperation, the user's motor and sensory status, willingness and ability to imitate hand postures, inclination and potential to use pictures versus gestures, comprehension of gesture, degree of integrity of the oral musculature and phonological systems, and representational skills.

It is thus clear that there is, as yet, no way of predicting precisely how a given individual will respond to the introduction of an augmentative communication system. As things stand, and given the suggestion in a number of studies that the best predictors, at least in the area of Blissymbol use, are derived from performance with symbols, Kiernan, Reid Jones (1982) conclude that there is little justification for excluding individuals from programmes on pre-selection criteria. What is now needed is good retrospective and prospective research that will help to determine whether the augmentative system ultimately used with an individual can be predicted through systematic application of what criteria, and whether there is a hierarchical relationship among such criteria that would yield a system of weighted factors which would in turn increase predictive accuracy (Lloyd and Karlan, 1984).

Chapter 13. Experimental Comparisons Across Systems of Augmentative Communication

The selection of an augmentative communication system for a given individual should be based not only on what is known about the characteristics (and preferences) of that individual, but also on knowledge of the advantages and disadvantages inherent in the various systems themselves. Views on the relative merits of different systems were discussed in Chapter 7.3, but there is to date very little actual evidence to call on in choosing among them. The few studies which have attempted to compare augmentative systems experimentally will be reviewed in the present chapter.

Sign systems differ in various aspects which may be important in determining their relative success. Two such factors are the motor requirements for sign production, and iconicity (defined as any aspect of a gesture which is delineated by, resembles or suggests its referent (Daniloff, Lloyd and Fristoe, 1983)). A number of studies investigating the acquisition of individual signs (e.g. Konstantareas, Webster and Oxman, 1979) have demonstrated a significant advantage for iconic as opposed to non-iconic signs. Researchers have also sought to determine whether sign systems as a whole differ in iconicity or in the degree to which they are understood by untrained observers (sign transparency), and whether this makes a difference in terms of acquisition and use. Hoemann (1975) and Klima and Bellugi (1979) found that the meanings of 10% to 30% of ASL signs were transparent to sign-naive hearing adults. Griffith, Robinson and Panagos (1981) similarly reported rates of 21% guessability for college students and 13% for hearing first-grade children, for ASL signs commonly used with mentally handicapped children. Similar studies have not been done for BSL signs, but Grove (1982) considers it likely that here, too, the percentage of transparent signs would be relatively small. By contrast, in a series of studies by Skelly (1979), over 80% intelligibility was found for Amer-Ind Code signals presented to non-instructed viewers. Even Daniloff, Lloyd and Fristoe's (1983) more conservative finding of 50% transparency for signals presented in isolation (i.e. out of context) shows Amer-Ind to be significantly more transparent than ASL. In support of this conclusion, Kirschner, Algozzine and Abbott (1979) compared the learning of 20 Amer-Ind and 20 ASL signs by college students, and found that the former were significantly easier to guess, learn and retain. Unfortunately, the findings of these studies are limited in that exceptional students were not used as subjects.

The studies thus indicate that, at least for non-handicapped children and adults, Amer-Ind has a significant advantage over ASL in terms of its high transparency and the relative ease with which its signals are acquired and retained. Daniloff and Vergara (1984) further found that the production requirements of Amer-Ind signals are motorically simpler than those of ASL. Comparing the total corpus of Amer-Ind signals to equivalent ASL signs, they showed that many more of the Amer-Ind signals are static and are produced with one hand, while significantly fewer require a change in orientation or involve bilateral positioning with both hands. Amer-Ind signals also require significantly fewer hand positions than ASL signs. On the other hand, one must bear in mind that, in contrast to ASL, Amer-Ind cannot provide its users with all the complexities and nuances of a 'complete' language.

Kiernan (1983c) reported comparisons of three sign systems (ASL, BSL and PGSS) in terms of various structural characteristics. He found striking similarities between ASL and BSL, the two sign languages which have evolved in use by the deaf, as opposed to the contrived PGSS. ASL and BSL employ relatively more 'flat hands', 'fist hands' and 'index finger hands' than does PGSS. They further use 'two-hand-different' signs and 'hand-body' contact less frequently, and movement and 'hand-face' contact more frequently. Kiernan and Bowler (1980; Kiernan, 1983c) then examined the ability of mentally handicapped children to imitate and to learn signs which were designed to reflect these parameters. They found high rankings of the 3 types of hand shape used most commonly in ASL and BSL in terms of imitation, acquisition and retention. They further found that 'two-hand-different' signs were more difficult to imitate and learn than either 'one-hand' or 'two-hand-same' signs. These findings suggest that PGSS has selected more difficult types of sign, whereas ASL and BSL have both selected signs requiring simpler movements and hand postures. Despite these differences, the only evidence to date comparing the performance of children on BSL (within the framework of the Makaton Vocabulary) and PGSS programmes (Kiernan, Reid and Jones, 1982) found no differences between the two groups in the number of signs used and understood or in the use of multi-term utterances. These data must be accepted with reservations because of the way in which they were gathered (using questionnaires and with no reliability checks), but they raise the possibility that teachers may modify signs to make them easier to execute, or that teachers make greater efforts to teach what they see as difficult signs (Kiernan, 1982). This issue, and the question of whether the use of contrived systems which mirror spoken English (e.g. PGSS) leads to a more rapid learning of spoken English than do the 'natural' sign languages (ASL and BSL), must await further investigations.

Symbol systems, too, differ in various aspects, one of which is iconicity. Rebus systems are pictorial, although with an admixture of conventional symbols; Blissymbols incorporate pictorial and ideographic as well as some arbitrary symbols; while Premack-type symbols avoid pictographs altogether (Remington and Light, 1983). A number of studies have examined the importance of iconicity in effecting the relative success of different systems.

Clark (1981) compared the ease of learning words represented in 4 symbol systems (Rebus, Bliss, Non-SLIP and traditional orthography) among 36 normal preschool children. She found that the more meaningful or iconic the representation, the easier it was learned. Thus Rebus symbols were easier to learn than Blissymbols; both were easier to learn than Non-SLIP symbols; and all 3 were easier to learn than traditional orthography. Hughes (1979) found that Blissymbols were simpler for mentally handicapped students to learn than written words. Musselwhite and Ruscello (1984) compared the transparency of Blissymbols, Picsyms and Rebus symbols with handicapped children, and found that significantly fewer Blissymbols were identified correctly than were either Picsyms or Rebus symbols. They attribute the lower transparency of Bliss to the fact that it incorporates considerably less graphic detail, and has a larger proportion of ideographic symbols (symbols in which drawings represent ideas rather than specific referents), and thus a greater degree of relative abstractness. Further, when the subjects were questioned about their reactions to the 3 systems, all but 1 felt that the Blissymbols were the most difficult, but they were equally divided on the question of which system they liked best. Hurlbut, Iwata and Green (1982) also compared the Blissymbol system and an iconic picture system, in this case in terms of acquisition and use by 3 severely handicapped cerebral palsied children. Results showed that students required approximately 4 times as many trials to acquire Blissymbols than pictures, and maintained a higher percentage of iconic pictures. Further, stimulus generalization was greater for the iconic system, and more iconic responses than Bliss responses were shown in daily spontaneous usage.

The above results thus suggest that the more iconic a system is, the more readily it is acquired, maintained and generalized to daily situations. However, while an iconic picture system may have a number of advantages over a more abstract symbol system as an initial means of communication for handicapped individuals, this superiority may not extend to situations requiring more complex verbal skills. Iconic stimuli cannot be used for all parts of speech, or to represent abstract concepts. Moreover, there is some evidence that iconicity can hinder subsequent transfer to non-iconic signs. Kuntz, Carrier and Hollis (1978) found that while mentally handicapped children learned associations to pictorial symbols more rapidly than to Premack-type abstract symbols, transfer to traditional orthography was slower with the more pictographic system. This finding was confirmed by Worrall and Singh (1983). Kiernan (1983c) concludes that if the aim in training is to provide a ready communication system, more pictographic systems would seem to be indicated; but if the aim is to transfer to reading, a more abstract system is to be preferred. Other questions relevant to symbol system selection have yet to be addressed experimentally, for example whether the use of manipulable (Premack-type) as opposed to non-manipulable symbols aids the acquisition of sentence structure.

There is also little research comparing the ease of learning symbols versus manual signs. In line with assertions that symbols have the advantage of removing memory load and simplifying the motor response that must be learned (pointing versus signing), there are indications in at least 2 studies of sign training having failed with severely handicapped children who were then successfully introduced to picture systems (Lancioni, 1983; Murphy, Steele, Gilligan et al., 1977). In contrast, Bristow and Fristoe (1984) directly compared the ease of learning ASL signs and ideographic symbols as names for pictures, using normal children, and found no significant differences in rate of acquisition or retention. Whether this would also be the case for handicapped children has yet to be determined. These authors did, however, find large individual differences within groups. The subjects' performances ranged from learning both types of representation in the same number of trials to taking twice as many trials to learn one type as the other; and subjects differed in whether they learned signs or symbols more quickly. Thus, overall one system was not superior to the other, but some individuals found one system easier to acquire than the other.

Further research is clearly called for concerning the relative merits of each communication system with different groups of language impaired individuals, so that trainers might be in a better position to decide which system best suits which kind of individual. However, more recently a number of writers have advocated another approach, which runs counter to the tendency to assign individuals to either a sign or a symbol programme. Hamre-Nietupski, Stroll, Holtz et al. (1977) and Reid and Kiernan (1984) suggest that sign and symbol teaching may sensibly be coordinated, since the 2 types of systems have different strengths. They argue that a non-verbal individual's communicative abilities would be greatly enhanced if he/she possessed the skills necessary to use several augmentative systems concurrently, depending on the situation, the context of the message, the available equipment, and the receptive language skills of the message receiver. And even if the person is unable to maintain two or more systems, this approach would enable comparison of rates of acquisition, and would also enable the individual concerned to determine the system he/she prefers. Kiernan and Jones (1981) developed such a scheme embodying the use of pictorial symbols, simplified signs and speech, with the aim of providing a model for diagnostic teaching that would allow comparison of response to signs and symbols. Of 3 mute children with whom the programme was used, one acquired a few signs but no symbols and so progressed to sign teaching; a second child learned the first 2 symbols more rapidly than the corresponding signs, and sign teaching was abandoned in favour of continued symbol teaching; the third child responded well to both signs and symbols and this joint approach was therefore continued. Reid and Kiernan (1984) also used such an approach with 7 severely mentally handicapped children with little or no spoken language. A choice phase was built into the programme, so that once signs and symbols were over-learned, a judgement of preferred mode could be made in terms of relative rates of use of signs and symbols in requesting objects. Only 1 child showed a marginal preference for using signs, while the remaining subjects showed various degrees of bias to symbol choice. MacDonald (1984) presented a description of a severely deaf 12-year-old athetoid boy who used both Makaton Signing and Blissymbols spontaneously with relatively equal fluency and equal preference. Analysis of the boy's communication samples over a period of 15 months showed that Social Responses and Requests were usually signed, while Blissymbols were used almost twice as frequently as signs for Spontaneous Comments and Reporting. MacDonald suggested that signing was selected for requests so that they could be signalled quickly while the viewer's attention was held. However, the more complex information conveyed in spontaneous reporting was probably easier in Blissymbols, where the vocabulary is recognized rather than recalled. Furthermore, signing was used for short spontaneous remarks, while Blissymbolics was preferred for longer, more complex utterances. Again, the permanence of the symbol display probably made it easier to compose longer word strings. In the only other published study to date using a combined approach, Reichle and Ward (1985) taught a moderately handicapped boy who was using both SEE signs and an alphabetic encoding device (a Sharp Communicator) to use each of these two augmentative systems discriminatively. The boy was taught to ask his speaking partners whether they understood signing, and then to use either his memowriter or signing, depending on their response.

Chapter 14. The Impact of Augmentative Communication Training on the Development of Speech

There is sometimes considerable resistance to the use of sign and symbol systems from parents and teachers who fear that introducing augmentative systems might discourage speech development. The question of the impact of these systems on users' speech output is crucial since, as Silverman (1980) points out, if they were shown to have deleterious effects in this area, clinicians and teachers might justifiably hesitate to introduce them if there was any chance that the individual in question could learn to communicate with speech. However, the studies conducted to date have in fact shown that the use of signs and symbols does not inhibit functional vocalization or speech development and may, in many cases, enhance oral expression.

Reports of vocalizations or speech developing after sign teaching have been mentioned anecdotally in many studies. Balick, Spiegel and Greene (1976) reported improvement in speech in all 5 of their mentally handicapped students who were taught mime, while Kopchick, Rombach and Smilovitz (1975) found that after some 6 months of sign teaching, 3 of 11 mentally handicapped adults began to use 2-word or longer spoken phrases. Fifteen of Duncan and Silverman's (1977) 32 mentally handicapped children, who were taught Amer-Ind over 10 weeks, demonstrated increased attempts at speech production. Grinnell, Detamore and Lippke (1976), too, reported increases in the verbal abilities of mentally handicapped subjects taught signs. Some of their severely mentally and multiply handicapped pupils began to pair sounds with signs. Children who entered the programme using some speech sounds increased the number of sounds produced, while others progressed to saying complete words. Still others improved in intelligibility and began talking in grammatically correct sentences. Stremel-Campbell, Cantrell and Halle (1977), Linville (1977), Kahn (1977) and Wolf and McAlonie (1977) found increased oral production in 14 of 25 severely mentally handicapped children and adolescents instructed in simultaneous sign and speech communication. Hobson and Duncan (1979) similarly noted that all of their 9 Down's Syndrome subjects exposed to signs for only 6½ weeks were judged to have become more vocally expressive at the end of the study.

More recent sign training studies, also with mentally handicapped individuals, have confirmed these findings. Of 21 severely and profoundly mentally handicapped children instructed in Amer-Ind by Daniloff and Shafer (1981) over one year, 12 manifested vocal accompaniment of gestures at least 50% of the time; 3 showed increased intelligible speech, and for 2 subjects verbal output exceeded their gestural output. All 3 of McDade, Simpson and Booth's (1980) Down's Syndrome children, and 2 out of 3 of Stull, Edkins, Krause et al.'s (1980) severely and profoundly mentally handicapped children, showed progress in the development of oral language after exposure to sign and speech training over a 6- to 10-month period. Schepis, Reid, Fitzgerald et al. (1982), too, found that increases in vocalization accompanied increased levels of signing in 4 of 9 profoundly mentally handicapped youngsters. Using 3 severely mentally handicapped adults, Wells (1981) found greater improvement in the articulation of words trained by the total communication method, when compared with matched words trained according to traditional speech therapy methods. Finally, in surveys of sign use in special schools and units in the U.K., Walker (1978) reported that 30% of 1004 Makaton Vocabulary sign users were rated as showing improved vocalization and 25% improved speech, while Kiernan, Reid and Jones (1982) found that 36% of severely mentally handicapped children using signs (mostly also BSL within the Makaton Vocabulary) were said to have improved vocalization or speech.

Studies on the use of sign with autistic children also present anecdotal accounts of the development of speech and vocalizations in many of the subjects. Creedon (1973, 1976) reported that approximately two-thirds of 30 autistic children taught to sign over a 5-year period developed some speech, and 8 progressed to fluent speech without sign. Those children who spontaneously generated speech began fading the use of sign themselves. Miller and Miller (1973) described the acquisition of 'some' spoken words by 7 of 19 autistic children taught ASL signs. Similarly, 4 of 6 nonverbal autistic children trained in sign by Benaroya, Wesley, Ogilvie et al. (1977, 1979) produced some speech. However in 2 sign training studies of 6 and 9 months duration, Bonvillian and Nelson (1976) and Salvin, Routh, Foster and Lovejoy (1977) reported no improvement in expressive oral language in their 2 autistic subjects. All of Casey's (1978) 4 subjects showed improved vocalizations, as did the 3 nonverbal autistic children taught by Fulwiler and Fouts (1976), Cohen (1981) and Layton and Baker (1981), and 2 of the 5 autistic children taught by Konstantareas, Webster and Oxman (1979). Schaeffer (1978, 1980a, 1980b) taught signed speech to 3 nonverbal autistic boys in a highly structured programme which was characterized by a systematic attempt to transfer from sign to speech. The first stage of the programme involved teaching signs and verbal imitation separately. After several months the children began adding vocal approximations to their signs, and were then taught to sign and speak simultaneously. About 9 months into training, they began to speak without signing. At this point they were helped to fade the signs systematically. Schaeffer argues that the signs fostered spontaneity which transferred to speech.

Increased verbal communication attempts have also been reported in other groups of adults and children trained to use manual signs or signals,including nonverbal cerebral palsied children (Fouts, Shapiro and O'Neil, 1978; Kiernan, Reid and Jones, 1982; Levett, 1971b) and aphasic and apraxic subjects (Chen, 1971; Eagleson, Vaughn and Knudson, 1970; Skelly, 1979). All of these subjects were said to have made little or no progress in previous traditional speech therapy programmes.

Anecdotal accounts and survey findings of improved articulation and speech have similarly been reported in the literature on the use of symbol systems of communication. In her survey of 40 Blissymbol programmes in the U.S.A. and Canada, covering 150 children, McNaughton (1976b) cited improved vocalization in 30% of the Bliss users. Vocalization was reported to have decreased for 2 subjects, but both were said to be adolescents for whom vocalization had never been functional. In a subsequent survey by Silverman, McNaughton and Kates (1978), 21% of Bliss users were said to have improved in their use of functional speech, and there was an overall trend towards improved intelligibility. In the only U.K. survey of symbol users (Kiernan, Reid and Jones, 1982), only 14% of severely mentally handicapped Bliss users but 43% of physically handicapped Bliss users were reported as demonstrating improved use of spoken language. Interestingly, the level of reported improvement in speech for children in Rebus programmes was very much higher (72% of children). Turning to reports of individual symbol programmes, Harris-Vanderheiden, Lippert, Yoder and Vanderheiden (1979) found improved attempts at vocal utterances by 1 of 5 cerebral palsied children using Blissymbols over 2 to 3 years. Jones (1979) presented no quantitative data on his Rebus programme, but claimed that his nonverbal subjects began to vocalize once they had acquired approximately 30 symbols, while children who were able to vocalize at the outset, began to order their vocalization at about the same level of vocabulary.

Carrier (1976) claimed that many of the 180 mute mentally handicapped children who went through the Non-SLIP programme began to vocalize, and 56 of them later moved on to conventional speech and language therapy. It is, however, unclear whether all 180 children were indeed nonverbal at the onset of training. Improved speech was also reported for 1 of 2 autistic children trained by De Villiers and Naughton (1974) to use Premack-type abstract symbols, while Hodges and Deich (1979) noted the beginnings of spontaneous vocalization in 'some' of the low functioning nonverbal children whom they trained in Premack-type symbol use. Over half of 31 children of varying levels of ability who completed Porter and Schroeder's (1980) 3-year Non-SLIP programme improved on measures of receptive and expressive spoken vocabulary and mean length of spoken utterance. In addition, improved attempts to vocalize words were reported by McDonald and Schultz (1973) and Kladde (1974) for a number of nonverbal cerebral palsied children who were using word and letter boards for communication.

While the studies reported above all describe increases in oral expression for some of their subjects following sign/symbol training, few present baseline or post training measures in support of this conclusion, or include control conditions. As Remington and Light (1983) stress, to be sure that increases in speech following training are indeed due to the facilitative effects of sign/symbol learning, controls would be needed for the verbal component of the simultaneous communication programme, as well as for such non-specific factors as increased attention or stimulation provided by the teacher. To date, only a handful of studies have included such controls or directly investigated the possible mediating function played by signs in word learning. Bricker (1972) trained mentally handicapped subjects in sign imitation, sign-word pairing, and then sign-word plus object pairing. She was the first to claim that sign training could facilitate the receptive learning of word-object associations and hence the comprehension of spoken words through a mediation process. Van Biervliet (1977) extended Bricker's study by showing that both receptive and expressive use of spoken words is enhanced following sign-object and sign-word training. Kotkin, Simpson and Desanto (1978) and Barrera, Lobato-Barrera and Sulzer-Azaroff (1980) demonstrated the positive effects of a sign plus verbal presentation, compared to verbal-only training, on expressive word acquisition for 3 low functioning nonverbal children. Reich (1978) reported on a 1-month classroom intervention in which some spoken words were consistently paired with signs while others were not. The words paired with signs were found to be more readily recalled and used on post-test, again providing support for the mediation hypothesis. A problem noted by Kiernan, Reid and Jones (1982) is that adding signs presumably heightened the novelty of relevant words, which may well have led to increased potency. Reid (1981), too, showed that learning of words by mentally handicapped children was facilitated by sign learning, although there were some important individual differences among the subjects. All these results favour forms of mediation theory in which signs, as an easy-to-acquire mode, assist the acquisition of speech (Kiernan, 1983a). There is only one study on the facilitation of spoken syntax by sign teaching. Konstantareas (1984) found that the simultaneous use of spoken and signed functors in training was superior to the use of spoken functors alone, in facilitating preposition and pronoun acquisition and use in the speech of language impaired children.

In sum, there are no reports of adverse effects of sign or symbol training on the development of speech. The data indicate that for many individuals speech improves; however for others speech output remains negligible, despite gains in the ability to use signs or symbols. One reason for this is undoubtedly the fact that the studies differ in the degree to which they programme speech development (Kiernan, 1983a). Schaeffer (1980b), for example, built a specific verbal component in to his training scheme. However, subjects differ in the development of speech even <u>within</u> signing or symbol programmes, and an important question for researchers concerns the characteristics of the individual which are associated with the facilitation of spoken language. Among skills which might be relevant, Kiernan, Reid and Jones (1982) suggest existing levels of phonological development, integrity of speech mechanisms, the degree to which individuals can and do process auditory and visual input, existing communicative use of sounds, and imitative abilities. There is to date little relevant evidence on this question, but Carr and Dores (1981) and Carr, Pridal and Dores (1984), in 2 sign training studies with mentally handicapped autistic children, have shown a positive relationship between the acquisition of understanding of verbal cues and verbal imitation ability. Neither mental age nor language age were predictive of performance. Moreover, skill in verbal imitation was not predictive of sign acquisition, but only of receptive speech label acquisition. Carr (1979) also reviewed 7 studies in which simultaneous communication was used with 52 <u>mute</u> autistic children. Of these, only 12 developed some expressive speech, consisting mostly of only a few words or word approximations. Other simultaneous communication training studies, involving echolalic children, found significantly improved expressive and/or receptive speech, as well as gains in signing. Konstantareas, Webster and Oxman (1979), too, noted that the only 2 of their subjects who came to use speech with their signing were also the only subjects to have had some degree of verbalization at the outset. Carr and Dores (1981) thus conclude that, at least in the case of autistic children, there are 2 subgroups of language impaired children, each of which exhibits a different pattern of language acquisition when exposed to simultaneous communication training. Those children with poor initial verbal imitation skills acquire signing but not receptive speech, while children with good verbal imitation skills or echolalia acquire both receptive signing and receptive speech. It may further emerge that it is these latter children who also develop expressive speech following sign training. Kiernan (1983a) elaborates on this further by suggesting that when children are mute they tend to respond poorly to speech and do not learn to use speech expressively; when children are proficient at attending to and discriminating among auditory stimuli (indicated by a high verbal imitation score), speech and sign potentiate each other in expressive learning. This would suggest the need to teach verbal imitation skills to nonverbal children as a separate task if speech development is to be potentiated (e.g. Schaeffer, 1980b).

The only other indication to emerge so far in the literature concerning subject characteristics associated with the facilitation of speech is Creedon's (1973, 1976) observation that all of her autistic subjects who had begun learning to sign before age 4½ developed fluent speech.

There are many possible contributory factors to the phenomenon that sign and symbol users often move on easily to producing speech. Schaeffer (1980b) suggests 3 reasons: Firstly, receptive word-sign-object associations are facilitated during sign training; secondly, the coordinated rhythmic movement patterns of signing may in some way encourage concurrent verbalizations and foster the development of more coordinated, rhythmic speech; and thirdly, signs (and symbols) present an intermediate step between goal-directed hand movements, which the child learns will lead to the achievement of material goals, and the achievement of social goals. By signing the child achieves those social goals and then, through the association of sign and speech, learns that speech can achieve social goals. The use of a sign or symbol may be the first time that the child has experienced the means-end relationship involved in communication, thereby providing a first critical step to speech. Kiernan, Reid and Jones (1982) offer other possible reasons as well. The use of signs or symbols restructures the teaching situation in ways which are likely to facilitate acquisition of speech. Teachers are more likely to simplify their verbal input to the learner in terms of vocabulary and syntax if they are also using signs or symbols. The result will be a simplified language structure which is more accessible to the learner. The teaching of signs commonly involves teaching imitation of motor responses, a skill which may well generalize to the imitation of vocalization and lead to speech. Teaching students to sign or indicate symbols often involves the teacher in focusing their attention more actively than is the case in speech programmes, which may in turn improve auditory attention. Furthermore, the redundancy present in the simultaneous communication programme, with both speech and signs/symbols conveying the same information, means that the learner can use remembered signs/symbols as cues for forgotten words, and remembered words as cues for forgotten signs/symbols. Harris-Vanderheiden and Vanderheiden (1980) suggest that augmentative communication systems may enhance oral expression in 2 additional ways: Firstly, tension or pressures related to oral expression will be reduced by providing an augmentative mode to fall back on should the spoken message be unintelligible. Thus, for example, the cerebral palsied child who tenses with anxiety and frustration when making an effort to speak, may be allowed to relax by using an augmentative aid, and therefore is likely to vocalize more readily. Secondly, the more successful communication experiences resulting from sign or symbol use may result in increased motivation to attempt speech. Moreover, the teachers or parents themselves may find renewed motivation when introducing a new approach to language teaching.

As yet, researchers are still not in a position to decide between the various possible facilitating roles which signs and symbols might play in relation to the acquisition of receptive and expressive oral language.

Chapter 15. Nonlanguage Benefits of Augmentative Communication Training

Progress in the use of sign and symbol systems has also been associated with improvements in other aspects of the individual's functioning, including increased concentration, reduction in aggressive behaviour, increased social interaction and willingness to participate in group activities, and improved performance in the classroom. Unfortunately, most of the reports describe such changes only in impressionistic terms, without systematic observations, and without controls for increased attention and stimulation.

In the studies using signs with mentally handicapped and autistic children, increases in attention have been reported by Balick, Spiegel and

Greene (1976), Benaroya, Wesley, Ogilvie et al.(1977), Bonvillian and Nelson (1976), Fulwiler and Fouts (1976), Linville (1977), Skelly (1979), and Sutherland and Beckett (1969). Decreases in frustration, temper tantrums and other inappropriate behaviours were noted by Balick, Spiegel and Greene (1976), Berger (1972), Bonvillian and Nelson (1976), Brookner and Murphy (1975), Casey (1978), Daniloff and Shafer (1981), Duncan and Silverman (1977), Fulwiler and Fouts (1976), Hoffmeister and Farmer (1972), Linville (1977), Miller and Miller (1973), Millington (1976), Schaeffer, Musil, Kollinzas and McDowell (1977), Skelly (1979), Topper (1975), Webster, McPherson, Sloman et al.(1973) and Wilson (1983). Improvements in social interaction and cooperation were reported by Benaroya, Wesley, Ogilvie et al.(1977), Berger (1972), Bonvillian and Nelson (1976), Casey (1978), Creedon (1976), Duncan and Silverman (1977), Fulwiler and Fouts (1976), Konstantareas, Oxman and Webster (1977), Linville (1977), Salvin, Routh, Foster and Lovejoy (1977), Schaeffer, Musil,Kollinzas and McDowell (1977), Sutherland and Beckett (1969), Wherry and Edwards (1983) and Wilson (1983). Studies with autistic children have additionally reported reductions in the occurrence of bizarre, stereotyped behaviours (Bonvillian and Nelson, 1976; Carr and Kologinsky, 1983; Creedon, 1973; Miller and Miller, 1973; Schaeffer, Musil, Kollinzas and McDowell, 1977; Webster, McPherson, Sloman et al., 1973). Other changes noted include higher levels of play (Benaroya, Wesley, Ogilvie et al., 1977; Creedon, 1976; Konstantareas, Webster and Oxman, 1979), increased interactions with objects (Creedon, 1976), and acquisition of rudimentary abstraction and concept formation skills (Benaroya, Wesley, Ogilvie et al., 1977, 1979). On the basis of postal surveys, Walker (1978) found 67% of sign users to have improved in eye-contact, 64% in attention and 48% in sociability. Goodman, Wilson and Bornstein (1978) found increased attention reported for 76% of sign users, improved motivation for 78% and decreases in behaviour problems for 53% of signers. Almost all of the above reports are anecdotal, with no systematic observations or data to support their claims.

The studies reporting on the nonlanguage benefits of symbol use are also largely anecdotal. Kates and McNaughton (1974) noted greater self-assurance in 19 cerebral palsied children taught Blissymbolics, while Harris-Vanderheiden, Brown, MacKenzie, Reinen and Scheibel (1975) and McDonald and Schultz (1973) claimed increased social interaction and motivation to communicate, and reductions in frustration, for their communication board users. Improved attention span and cooperation were reported by Hodges and Deich (1979) for mentally handicapped children taught to use Premack-type plastic symbols. In a survey of Blissymbol programmes covering 157 mainly cerebral palsied children, Silverman, McNaughton and Kates (1978) found positive changes in alertness, as well as in terms of initiation of interactions, and a wider range of settings in which the child communicated. In Kiernan, Reid and Jones' (1982) survey of symbol programmes in U.K. schools, increased attention span was reported for about 50% of symbol users; improved motivation was reported for 58% of physically handicapped users but only 29% of severely mentally handicapped users; and improved classroom behaviour was reported for 36% of physically handicapped and 18% of mentally handicapped children. Other changes found by Kiernan et al. for a few children included reduced frustration, and increased self-confidence and social interaction. McNaughton (1976a) further pointed to the facilitation of reading, in that 3 Blissymbol users acquired a sight vocabulary through frequent exposure to the words printed beneath their symbols, and these words were later used as a base in the transfer to reading.

It has been suggested that much of the overall improvement reported in children's social behaviour, motivation and cooperation rests with the fact that the children are able to communicate their needs and desires more effectively with signs and symbols, and are thus less frustrated, and correspondingly teachers and parents are likely to feel less tense and frustrated in interactions. However, a major difficulty with these reports is that they tend to describe initial problems and changes anecdotally, without systematic observation. And even when rating forms are used, their derivation and reliabilities are unclear (Kiernan, 1983a). A further problem is that most studies involve complex treatment packages, including specific instruction in play skills, programmes for controlling undesirable behaviours, and many other interventions. In the absence of controls, one must be weary of attributing all gains that occur solely to sign or symbol use (Carr, 1979). As Kiernan, Reid and Jones (1982) stress, it is not yet known whether such improvements arise because of increased attention to subjects, because of the introduction of a more interesting regimen, because of enhanced interactions with adults, or because of the introduction of a structured communication programme of some sort. At present it can only be said that changes in other behaviours occur in the context of sign and symbol programmes.

Chapter 16. Shortcomings of Research Evaluating Augmentative Communication System Use

16.1 General Review

While the studies conducted to date all provide support for the value of using sign and symbol systems with a variety of language impaired groups, they are beset by methodological problems which considerably weaken the impact of their findings. Good research design involves a number of basic requirements (Gelfand and Hartmann, 1968; Howlin, 1984; Yule and Berger, 1975). These include: adequate baseline measures of subject characteristics; detailed descriptions of training and therapeutic procedures; reliable and objective assessment of behavioural change; rigorous follow-up and generalization data; and the use of control groups or systematic variation of treatment/training contingencies. The vast majority of studies in the field of augmentative communication training fail to comply with most, if not all, of these requirements.

With very few exceptions, the studies present limited information concerning the subjects, and this is mostly reported anecdotally, rather than through the use of objective measures. Several studies omit information on chronological age, and many omit details of IQ or mental age (e.g. Benaroya, Wesley, Ogilvie et al., 1977, 1979; Grinnell, Detamore and Lippke, 1976; Richardson, 1975). Kiernan, Reid and Jones (1982) point out that in other cases, where IQ or MA <u>is</u> given, either the tests used are not indicated (e.g. Hoffmeister and Farmer, 1972), several different tests are used in the same study, or assessment procedures of dubious validity are applied. Initial levels of speech expression and comprehension and other aspects of pre-training communicative competence (such as the comprehension and use of gestures) are often not mentioned, or are described only in general terms (e.g. Benaroya, Wesley, Ogilvie et al., 1977, 1979; Hobson and Duncan, 1979; Richardson, 1975). A typical example, cited by Remington and Light (1983), is the description of subjects as 'nonverbal' or 'not using speech for communication purposes' (Carrier, 1976), as the sole information on pre-training language level. In other cases ad hoc rating scales and non-standardized adaptations of existing tests are used, with no information on their reliability or validity (e.g. Walker, 1973, 1977). Often, no information is provided on the subjects' ability to attend to instructions, on degree of cooperation in teaching situations, on level of physical involvement, on the criteria for assignment to diagnostic categories (particularly when terms like autism or aphasia are used), or on the presence and extent of hearing loss. For example, of 19 sign training studies published in America between 1969 and 1979, which were examined by Poulton and Algozzine (1980), only half mentioned the hearing acuity of their subjects, and of these 8 did not present hearing test data.

Other important aspects of pre-training behaviour which have been stressed by Kiernan, Reid and Jones (1982), but which are typically omitted in sign and symbol studies, are description of phonological systems, of the presence and extent of speech musculature impairment, and of the ability and willingness to imitate hand postures, even though motor imitation is likely to be of crucial importance for progress in sign training. In addition, few studies present details of the type of training used prior to the introduction of sign or symbol systems. Kiernan et al conjecture that in many cases sign/symbol teaching was probably the first experience that subjects would have had of any type of structured communication teaching programme. They add that if this supposition is correct, there are clear problems in evaluating outcome.

Since the severely language impaired population is such a heterogeneous one, the description of subjects is vital. As has been stressed repeatedly in previous chapters, the extent to which individuals have benefitted from sign and symbol training varies enormously, even within studies. The failure of the majority of studies to provide even basic data on subject characteristics has meant that in most cases it is impossible to evaluate the possible role of such factors in effecting the outcome of training, and therefore to determine the applicability of given programmes to other language impaired individuals.

In addition to poor subject description, most studies contain little description of the training procedures employed, and some even omit details of the total number and duration of teaching sessions, and of the particular augmentative system taught (e.g. Hall and Talkington, 1970; Hughes, 1974/5; Richardson, 1975; Sutherland and Beckett, 1969). A detailed description of training methods is crucial to the replicability of any training study and to interpretation of the results. While most sign training studies mention the use of modelling, imitation and physical prompting, there is minimal information on what is actually done in training sessions. One notable exception among the symbol studies is Carrier and Peak's (1975) Non-SLIP programme, which presents a clear, step-by-step outline of procedures; but unfortunately little concern is shown in this programme for generalization to natural settings (Kiernan, 1983c). A major factor in the success of a communication programme is claimed to be the involvement of significant others in the sign or symbol user's environment. However, very few studies report on whether peers, teachers or parents used the system in question with the student. And even in those reports where special efforts were made to encourage significant others to use the system in everyday settings (e.g. Kopchick, Rombach and Smilovitz, 1975), no data are provided on <u>actual use</u> by normal speakers, so the effectiveness of the intended universal programme cannot be assessed (Calculator and D'Altilio Luchko, 1983).

Reviews of the literature (Kiernan, 1977; Kiernan, Reid and Jones, 1982; Remington and Light, 1983) have further pointed to the minimal information that is provided in studies on the outcome of sign and symbol training, and to the inadequate recording of dependent variables. Most studies give the numbers of signs/symbols used or understood by subjects at the termination of training, although in some cases without any apparent formal evaluation of these having been undertaken (e.g. Harris-Vanderheiden, Brown, MacKenzie et al., 1975; Hoffmeister and Farmer, 1972; Sutherland and Beckett, 1969). And where there is formal assessment of the number of signs/symbols learned, scoring criteria are often vague and appear to vary widely from study to study (Kiernan, 1977). For example, Kopchick, Rombach and Smilovitz (1975) recorded the different signs used by subjects over a 6-month period, thereby apparently allowing a subject to learn and forget a sign but still to be credited with it. By contrast, Hall and Talkington (1970) and Walker (1973) assessed sign production and understanding in response to pictures in special test sessions. In few studies are such assessments accompanied by estimates of inter-observer agreement or comment on the quality of signs produced. As Remington and Light (1983) point out, the question of reliability is especially important in the case of manual signs, which may be performed by students with varying degrees of accuracy. A further criticism concerns the claims made in many training studies about accompanying improvements in speech output, social skills and other behavioural indices. These reports are typically anecdotal, lacking adequate and reliable assessments to back them up.

Bonvillian and Nelson (1978), Carr (1979) and Kiernan (1981b) have all called for process studies rather than simply outcome studies, with the testing of sign/symbol comprehension and production skills and other relevant behaviours periodically during the course of training. The study by Harris-Vanderheiden, Lippert, Yoder and Vanderheiden (1979) is the only one to date to provide data on the acquisition of an augmentative system over time by sampling across training periods. However, the information it provides is limited to the number of symbols acquired and average length of symbol utterances (with no details on how these were assessed).

Of even greater significance is the failure of most studies to examine the generalization of sign/symbol use to naturalistic settings, and their failure to demonstrate the employment of the systems in genuinely communicative behaviour. One of the few exceptions is Harris's (1982) observation of augmentative aid users in classroom settings, to assess interaction processes with teachers. Similarly, apart from the studies of Bonvillian and Nelson (1976), Fenn and Rowe (1975), Fulwiler and Fouts (1976) and Layton and Baker (1981), no attempts have been made to analyse the semantic relations expressed by augmentative aid users in their sign or symbol utterances. As noted by Kiernan, Reid and Jones (1982), the opportunity has also not been taken to record multi-sign/symbol utterances across time, thereby providing a picture of developing semantics and syntax.

Another shortcoming of the published studies in the field of sign and symbol use, highlighted by Kiernan (1981b), is that many of them are anecdotal single case reports. Few studies include adequate levels of experimental control, and very few compare systems or teaching procedures or analyze the effects of potentially relevant variables. Thus, of 19 sign training studies with mentally handicapped individuals published in America between 1969 and 1979, which were identified by Poulton and Algozzine (1980), 10 were clinical reports of single cases or descriptions of programmes; 4 were clinical studies, each involving between 9 and 12 subjects and a control group or a statistical analysis to evaluate the effects of a defined treatment strategy; and only 5 were research studies in which aspects of the subjects' response to training were investigated experimentally, with discrete trials carefully designed according to established experimental design criteria. Moreover, the subject populations in 4 of these research studies were small, with only 2 to 6 subjects. Attention or speech training control groups are clearly needed if the effects of sign/symbol programmes are to be separated out from the effects of structured teaching per se, or even of extra attention or speech input. This is especially important where claims concerning the development of speech, reduction in aberrant behaviour or improvement in adjustment are concerned (Kiernan, 1977). Moreover, many studies have involved complex treatment packages, with sign/symbol training being accompanied by special programmes for controlling undesirable behaviours, extra sessions devoted to vocal speech training, and other interventions (e.g. Schaeffer, 1980b). Carr (1982) therefore cautions against attributing all gains in such programmes solely to augmentative system training. Howlin (1979), too, has stressed the importance of including adequate control groups in the evaluation of any programme designed to overcome linguistic and other developmental difficulties, pointing out that some of the changes attributed to the effects of treatment may be due instead to the passage of time and to children's own maturation. Clearly, much more systematic experimentation is needed to isolate those variables in training programmes that are critical to the development of skills of sign/symbol use.

Because of the methodological shortcomings of past studies and the many notable gaps in the literature on augmentative system use, many of the basic research questions on these systems remain unanswered. In the first place, while the body of sign training studies is by now quite substantial, evidence on the teaching of Blissymbolics and pictorial systems is still very sparse. In addition, there have been few systematic comparisons of the relative effectiveness of different sign and symbol systems to guide the selection of the most effective system for a particular language impaired individual. At present, workers in the field are unable to predict precisely how a given individual will respond to augmentative communication training, which handicapped children would benefit more from which type of programme, or which training approaches are most beneficial within a specific system. There are, for example, indications in at least 2 studies (Lancioni, 1983; Murphy, Steele, Gilligan et al., 1977) of sign training having failed with severely handicapped children. But inadequate description of subject characteristics and training procedures means that we are no nearer to knowing why some children fail to master signs. Research into procedures for fostering effective generalization of sign and symbol use are urgently needed. The finding of the facilitation of spoken communication in many of the studies also raises a number of as yet unanswered questions concerning the factors responsible for this facilitative effect, and the characteristics of individuals and training procedures that are associated with improved speech skills. A few researchers (e.g. Carr and Dores, 1981) are beginning to shed some light on these issues. More systematic experimentation with many different types of individuals is needed to allow for comparison and evaluation of the effects of different augmentative systems and techniques. Also needed are longitudinal studies to determine the long range effects of sign/symbol communication, and investigations of the acceptability of different systems not only to language impaired individuals themselves, but also to teachers, parents, peers and the general public.

16.2 Analysis of the Experimental Adequacy of Alternative and Augmentative Communication Training Studies with Language Impaired Populations

Following the example of MacDonough and McNamara (1973) and Howlin (1979), who reviewed general behaviour modification studies and operant language training studies, it was decided to use a tabular method of analysis to assess the extent to which past studies of augmentative communication training have fulfilled the requirements of adequate research design. The selection of studies reviewed is intended to be as comprehensive as possible, and to include all published reports of sign and symbol training with child and adult language impaired populations appearing in the literature up to December, 1984. Efforts were also made to obtain copies of unpublished papers and reports, and all those which could be traced are included in the review. Studies of deaf individuals are not included unless the subjects were also mentally or physically handicapped. Reports of survey findings (e.g. Kiernan, Reid and Jones, 1982), and descriptions of the use of particular systems in reports which are not training studies (e.g. Harris, 1982), are also not included in the present review.

The studies were assessed on the criteria proposed by MacDonough and McNamara, and Howlin, as follows: 1. The use of control or other training groups; 2. The provision of adequate baseline data on the diagnosis, age, IQ and language and communication levels of the subjects involved; 3. The specification of outcome data; 4. Adequate data presentation in the form of graphs or tables; 5. Detailed description of the nature and length of training sessions; and 6. The provision of unbiased reliability data. Howlin's (1979) procedure was adopted of scoring studies as positive (+) on a given criterion if adequate information/data were presented, and (O) if information was not presented. An intermediate score (±) was given if data were present but barely adequate, or if they were provided for only some subjects, or on only some of the relevant measures.

On the Control Group criterion, a study received a positive (+) score if it included a control group or procedure, or used more than one different training procedure. This criterion enables a researcher to infer that specific training variables and not alternative variables account for the changes observed. In the present review, however, the adequacy of such groups/procedures was not rated, so that among studies receiving a positive rating, there were still many where the control or alternative training procedures used were inadequate, due to poor matching or failure to equate on some important variables. Description of subjects on the criteria of Diagnosis, Age and IQ received a (+) rating if information on these variables was presented for all subjects and if, in the case of IQ, formal assessments were undertaken and reported. Where such information was given for only some subjects, or where only general descriptions of intelligence levels were given, the rating (±) was used. Baseline measures of Language and Communication were regarded as adequate (+) if either teachers' or parents' reports or formal measures provided a clear picture of the subjects' pre-training abilities. If anecdotal reports or minimal test results only were given, this measure was rated as (±). Similarly, Outcome measures were rated (+) if formal assessments of the subjects' levels following training were undertaken and fully described. If outcome was described anecdotally, or if only some of all relevant outcome measures were reported (e.g. if only the numbers of signs/symbols learned were given), this measure was rated as (±). For Data Presentation, studies were rated as (+) if they presented most of their results in graph or tabular form; (±) if only some data were presented in this way, and (O) if data were anecdotal. On the assessment of Description of Training, studies were rated as adequate if the details given allowed for full replication of the study and time involved. A (±) rating was used where some details of training procedures were included but these were inadequate for replication. For the Reliability of Measures category, studies were rated as adequate (+) if they made use of blind raters and gave reliability figures (e.g. when reporting data on use of signs/symbols), or used measures of known reliability. An intermediate score (±) in this category was given when studies used some objective way of recording data (such as video-tape recordings) but gave no reliability figures.

The tabulated list of studies is presented in Appendix 2, and is divided into three sections. The first section consists of the sign training studies conducted up to December, 1984; the second section comprises the studies using symbol systems of communication which were reported up to this date; and the third section comprises the studies using both signs and symbols in training. In each section the studies have been arranged alphabetically within successive years, and for each report information is also presented on the particular type of sign/symbol system used, and the number of subjects included in the study.

In all, there were 93 sign training studies, covering a total of approximately 1,118 subjects; 36 symbol training studies, covering 429 subjects; and 4 studies using both signs and symbols, covering 19 subjects. In terms of numbers, the sign training studies thus constitute a respectable body of data, for example when compared with Howlin's (1979) finding of a total of 167 language (speech) training studies reported in the literature between the years 1964 and 1978. In contrast, the number of symbol training studies conducted to date is far less satisfactory. Moreover, over half of both the sign and symbol studies used samples of only 6 subjects or less (see Table 2.1). It is even more disquieting to

Table 2.1: Distribution of Numbers of Subjects in Sign and Symbol Training Studies Conducted up to December, 1984

	Number of Studies					
Number of Subjects	Sign Studies		Symbol Studies		Studies Using Signs + Symbols	
	N	(%)	N	(%)	N	(%)
1	21	(22.6)	7	(19.4)	0	(0)
2 - 6	32	(34.4)	15	(41.7)	2	(50)
7 - 20	23	(24.7)	10	(27.8)	2	(50)
More than 20	16	(17.2)	4	(11.1)	0	(0)
No. not known	1	(1.1)	0	(0)	0	(0)

note that, up to December 1984, only 13 studies had been conducted on the teaching of Blissymbolics, covering a total of 57 subjects; and there were only 3 reports on the training of BSL signs within the framework of the Makaton Vocabulary, with a total of 8 subjects. The fact that the teaching of Blissymbolics and Makaton Signing is guided by so little research data is a cause for grave concern, particularly in the light of Kiernan, Reid and Jones' (1982) survey findings that these two augmentative systems are the ones most widely used with the nonverbal and language impaired children in special schools in the U.K.

Furthermore, while 2½ times more sign and symbol training studies were reported between the years 1977 and 1984 than had been reported between 1968 and 1976 (91 studies compared with 38 studies), the distribution of the number of studies conducted in successive years reveals no dramatic increases in the number of reports appearing in the 1980s (see Table 2.2). Major new research efforts will clearly be required if the future use of augmentative communication training is to be guided by increasing amounts of appropriate and systematic research based data.

Examination of the experimental adequacy of the augmentative communication training studies conducted up to December, 1984 reveals an equally bleak picture. Table 3 shows the percentages of studies fulfilling the 9

Table 2.2: Numbers of Sign and Symbol Training Studies Conducted in Successive Years

Year	Sign Studies	Symbol Studies	Studies Using Signs + Symbols
Up to 1972	8	0	0
1973 - 1974	6	9	0
1975 - 1976	11	4	0
1977 - 1978	21	8	1
1979 - 1980	13	8	2
1981 - 1982	18	4	0
1983 - 1984	16	3	1

experimental requirements described above. As can be seen from the table, the sign and symbol training studies have proved far from satisfactory. While adequate details on diagnosis and age are presented in 62% to 78% of the studies, adequate descriptions of subjects' IQ levels (in terms of details of IQ or M.A. scores) are given in only 24% of the sign studies and 28% of the symbol studies. Of even greater concern is the fact that adequate descriptions of subjects' initial language levels are provided in only 11% of the studies. Vaguer anecdotal descriptions of language levels are found in a further 61% of the sign studies and 75% of the symbol studies. The experimental design of the studies is also weak. Only 38% of sign studies and 19% of symbol studies included a control group or more than one different training procedure, while only 33% and 20% of sign and symbol studies supplied details of the reliability of their measures. Descriptions of training procedures and outcome measures, and the form of presentation of the data, were slightly more satisfactory, but even on these criteria adequate information was presented by only about 50% of studies. In the light of these findings, the research studies and reports on augmentative communication training appear to be very much weaker, in terms of methodology, than the operant speech training studies conducted in the 1960's and 1970's (Howlin, 1979). Howlin reviewed 167 such studies and found that over 85% of them gave adequate diagnostic and age data, 32% gave adequate IQ data, 53% included control groups or utilized some form of experimental manipulation, 73% included objective data presentation, and over 80% gave detailed descriptions of pre-treatment language levels and of treatment techniques.

Table 3: Percentages of Augmentative Communication Training Studies Fulfilling Experimental Requirements

Variable Assessed	Sign Training Studies			Symbol Training Studies		
		%			%	
	(+)	(±)	(O)	(+)	(±)	(O)
Control/Other Groups Included	38	0	62	19	0	81
Diagnostic Data	62	35	3	67	28	5
Age Date	73	16	11	78	19	3
IQ Data	24	49	27	28	55	17
Baseline Language Measures	11	61	28	11	75	14
Outcome Data	48	52	0	50	50	0
Objective Data Presentation	51	24	25	56	22	22
Description of Training Procedures	48	46	6	58	33	8
Reliability of Measures Used	33	11	56	20	22	58

Key: (+) Adequate data presented (O) No information given
(±) Data/Information presented but inadequate

A slightly more optimistic note can, however, be introduced by comparing the experimental adequacy of augmentative communication studies conducted between 1980 and 1984, with those conducted between 1975 and 1979. As can be seen in Table 4, a substantially greater proportion of the recent (1980-84) studies presented adequate information on 8 of the 9 experimental criteria that were rated, when compared with the percentages for studies conducted between 1975 and 1979. While the use of control groups, and the provision of details on IQ, diagnosis, baseline language levels and reliability of measures, remains largely inadequate even in these more recent studies, Table 4 does indicate that the experimental sophistication of sign and symbol training studies is improving over time.

Table 4: Comparison Between Training Studies Reported in 1975-79 and 1980-84 in Terms of Percentages of Studies Fulfilling Experimental Requirements

Variable Assessed	Sign & Symbol Studies 1975 - 1979 (%)			Sign & Symbol Studies 1980 - 1984 (%)		
	(+)	(±)	(O)	(+)	(±)	(O)
Control/Other Groups Included	26	0	74	49	0	51
Diagnostic Data	66	30	4	66	28	6
Age Data	73	17	10	87	11	2
IQ Data	24	53	23	34	47	19
Baseline Language Measures	8	64	28	15	70	15
Outcome Data	38	62	0	75	25	0
Objective Data Presentation	42	28	30	81	11	8
Description of Training Procedures	36	58	6	73	21	6
Reliability of Measures Used	23	15	62	49	13	38

Key: (+) Adequate data presented (O) No information given
(±) Data/Information presented but inadequate

PART IV: DESIGN OF THE STUDY

Chapter 17. Aims and Plan of Research

Despite the growing popularity of sign and symbol systems as augmentative communication modes for language impaired individuals, there is still very little information on how children acquire the systems, how they progress in their use over time, and what factors in the teaching methods, students and systems themselves are important for predicting success in sign and symbol use. Moreover, the studies which have been conducted to date (which are particularly few in the case of the symbol systems) are fraught with methodological problems which bring into question the reliability and generality of their findings, and weaken the impact of the conclusions that can be drawn (see Chapter 16). There is thus a clear need for more systematic and comprehensive descriptions of subjects trained in sign and symbol use, and for careful examination of the process of acquisition of an augmentative communication system, by following subjects up and sampling across training periods. Such information is of vital importance if workers in the field are to reach the position of being able to predict which type of training is most likely to benefit which sort of language impaired individual.

In national surveys of the use of sign and symbol systems in special schools in the U.K., Kiernan, Reid and Jones (1979, 1982; Jones, Reid and Kiernan, 1982) found that the majority of schools for severely mentally handicapped children (ESN(S) Schools) and physically handicapped children (PH Schools) had some kind of augmentative communication programme in operation with their severely language impaired pupils. Of 680 special schools responding to their 1978 survey, 53% reported using either signs or symbols or both, while in the 1980 survey 80.5% of ESN(S) Schools and 67.7% of PH Schools reported using an augmentative communication system. Kiernan et al. further found that two systems predominate in use in the U.K., namely Blissymbolics, and British Sign Language used within the framework of the Makaton Vocabulary (BSL (Makaton)). Of the schools using symbol systems in 1980, 99% of PH Schools and 73.8% of ESN(S) Schools used Bliss; and of schools using signing programmes, 66% of PH Schools and 91% of ESN(S) Schools used BSL (Makaton). The PGSS, once a fairly commonly used sign system, is now on the decline. Kiernan et al. found that in 1978 28% of ESN(S) Schools and 36% of PH Schools in the U.K. used PGSS, but that by 1980 these percentages had fallen to 4% of ESN(S) Schools and 8% of PH Schools. Kiernan et al. suggest that the differential adoption of BSL (Makaton) as opposed to PGSS may be due to the fact that Makaton is seen as a system which is relevant to the communication needs of the mentally handicapped, easy to learn and easy to use, whereas PGSS is seen as more difficult for teachers and children to learn and to use.

Despite the widespread use of Blissymbolics and BSL (Makaton) in special schools in the U.K., published data on the teaching and mastery of these systems are particularly scarce (see Chapter 16). The present writer therefore decided to examine the use of these two systems with cerebral palsied children, among whom there is a particularly high incidence of speech and communication difficulties (see Chapter 3). The initial intention was to compare progress in the acquisition of Bliss and BSL (Makaton) in matched groups of nonverbal cerebral palsied children. However, during the course of preliminary visits to schools and discussions with speech therapists and teachers, it became evident that the two augmentative systems are being taught to very different populations of language impaired children. Bliss is used predominantly in PH Schools, with nonverbal severely physically handicapped children who appear to be more able intellectually, whereas BSL (Makaton) is used largely in ESN(S) Schools with severely mentally handicapped children, some of whom are also physically handicapped. This impression was confirmed by Kiernan, Reid and Jones' survey findings (1982). In their 1978 survey, they found that 45.6% of ESN(S) Schools used a signing system, while only 13.9% used a symbol programme, and 12.4% used both signs and symbols. On the other hand, 46% of PH Schools reported using symbols, and only 20% used signs. A similar pattern emerged in the 1980 survey, when 77% of ESN(S) Schools reported using signs, and 58.2% of PH Schools reported using symbol systems.

In view of the above, the focus of the present investigation shifted, and it was decided to undertake a relatively long term descriptive study of the progress of two groups of nonverbal cerebral palsied children - one group learning Blissymbolics, and the other BSL (Makaton), at the schools they attend. The study aimed to examine the impact of these two augmentative modes on the communicative abilities of the children by following up their progress at six-monthly intervals over a total period of one-and-a-half years. Writers in the field have repeatedly stressed the need for research that will explore the intricacies of the augmentative communication process itself. The present study therefore includes a careful description of the children's developing acquisition and use of Blissymbols and BSL (Makaton). The intention was to move beyond the current practice of focusing primarily on sign and symbol vocabulary size, and in addition to gather records of the sign/symbol utterances produced by the children in semi-structured conversational settings. Such systematic recording of the children's communicative productions and the contexts in which they occurred, allowed for analysis of the developing grammatical form, semantic relations and pragmatic functions encoded by the subjects over time. It was hoped that this procedure would contribute to the characterization of the skills that constitute communicative competence through modes other than speech.

Other aspects of the children's language development, including the understanding and use of speech, the use of natural gesture, and inner language, were also monitored at six-monthly intervals, using standardized tests and recordings of speech samples. Since the primary goal of augmentative training is communicative interaction in daily living situations, the above procedures were further supplemented by questionnaires which were administered to parents, teachers and speech therapists, to obtain information on the use of signs and symbols, as well as of other means of communication, in the home and at school. The receptiveness of parents to the introduction of an augmentative system has been stressed by a number of writers as crucial if maximum generalization of use is to occur. This parental support factor, which is often ignored in training studies, was explored in the present investigation by questioning parents periodically about their attitudes to the use of Bliss/BSL (Makaton) with their children. Finally, the study also included systematic assessment of related variables, including the children's developing cognitive and perceptual skills, concentration, behaviour, social development, and physical and motor skills.

Goodenough-Trepagnier (1978) has pointed out that cerebral palsied children who have minimal or no speech production pose an interesting problem for the study of language acquisition. Such children have, in many cases, never been able to make use of repetition, to ask the names of objects, or observe the reactions of others to their linguistic productions. The development of cognitive skills prerequisite to communication may also be difficult, because in many cases the global nature of their motor handicaps means that they are severely restricted in interactions with and manipulation of their environments. At present there is very little understanding of the effects of developmental nonspeech conditions on language development (Yoder and Kraat, 1983). As there are so few studies of the general language acquisition process in cerebral palsied children, as well as of the long term progress of nonverbal children using augmentative communication modes, the descriptive nature of this study will, it is hoped, go some way towards filling these gaps in the cerebral palsy literature.

An added advantage of conducting a naturalistic study such as this, is that it is possible to obtain information on how schools teach augmentative communication systems, and on the extent to which they actually use the systems. Detailed information on these questions was gathered from teachers and speech therapists. The augmentative communication research studies conducted to date have typically involved many hours of intensive teaching in clinic settings, using skilled and committed researchers and clinicians. It is doubtful whether similar favourable conditions are to be found in all or even most schools, and the resulting picture of sign and symbol use may well be less favourable than that reported in the research literature.

The first major aim of the present investigation is thus a descriptive one - to describe the progress of the children in their use of Bliss/BSL (Makaton) over time, to monitor their general language development and changes in related skills and behaviours, to explore parental attitudes towards the use of the augmentative systems, and to examine the procedures used for teaching the systems to the children in schools.

It must be stressed at this point that the descriptive nature of the study brings with it certain limitations. In the first place, evidence from other research areas indicates that school and teacher variables, as well as programme variables, may be crucial in creating change. The children included in the present study attended a number of different schools and were taught by many different teachers and speech therapists. These variables are largely uncontrolled. Equally important is the fact that the children were not randomly assigned to the Bliss and BSL (Makaton) training groups - they were pre-assigned and, as already noted, factors such as level of intelligence and degree of physical handicap, as well as the prevalence of a given system in a school, are likely to have influenced these allocations by the schools. There are thus likely to be differences between the Bliss and BSL (Makaton) groups on important variables. Furthermore, while the present writer initially planned to include a control group of nonverbal cerebral palsied children not receiving any augmentative communication training, in order to allow for the effects of spontaneous improvements over time as well as the effects of structured teaching per se, this idea had to be abandoned for two reasons. Firstly, very few cerebral palsied children could be found who fulfilled the selection criteria, were nonverbal, and were not exposed to at least some augmentative communication training. And secondly, matched controls for such children are notoriously difficult (if not impossible) to arrange because the children vary so widely in their individual strengths and deficiencies. Nevertheless, it is felt that the descriptive nature of the study, with its careful selection of children, and with its detailed and systematic examination of changes in the subjects over time, is worthwhile in itself.

The second major aim of this study is to delineate some of the characteristics of the children, teaching situations and home environments, assessed at baseline, which are the most significant for subsequent progress in Bliss and BSL (Makaton) use. While some indicators on this question are already available from a few studies (see Chapter 12), there are as yet no assessment measures that consistently predict successful use of sign or symbol systems. Thus, as things stand at present, it is impossible to tell how a child will respond to a given system until it is actually tried (Kiernan, Reid and Jones, 1982). The absence of hard data on this issue has meant that in practice the criteria for system selection are largely idiosyncratic, and susceptible to influence by such factors as the popularity of a system at a given time, fashionable trends in education and therapy, and the ability of a system's proponents to 'sell' the approach (Davies, 1984). Decisions on which system to teach a given child appear, in many schools, to be based partly on practical considerations (viz. the system that is already in operation in a given school, or the system with which staff are familiar), and partly on intuition and 'received ideas' not backed by empirical evidence (for example, the belief that Blissymbolics is too complex a system to use with severely mentally handicapped children) (Fristoe and Lloyd, 1978; Jernqvist, 1981; Kiernan, Reid and Jones, 1982). Kiernan et al. found, for example, that children in Blissymbol programmes were in general more capable than children in signing programmes, suggesting that teachers were excluding less competent children from Bliss programmes because they saw the system as too difficult for them. Such gross matching in terms of overall expectations of cognitive development is, on present evidence, largely unjustified, because the relationship between the learning of Bliss and IQ (or levels of performance on psycho-educational tests) is simply not known. Moreover, in this writer's experience, such gross matching has occasionally resulted in a situation where Makaton Signing is the only system made available to a severely mentally and physically handicapped child, despite the fact that the child's motor handicap precludes the production of all but a few simple signs. In other cases, the reverse has been found, with upper limb function being the prime consideration in determining the choice of a sign or symbol system. Clearly, such gross guidelines are no way to guarantee the appropriateness of a system for a given individual (Kiernan, 1983c).

It is hoped that the present attempt to identify some of the factors affecting acquisition and progress in Bliss and Makaton Signing will help to clarify the issues involved in such decision-making processes. Among the subject characteristics that may well prove significant in this regard are: cognitive level, level of language comprehension, level of functional speech and potential for speech, motivation to communicate, sensory and motor status, perceptual skills, and imitation and gestural ability. Other factors, including parents' attitude to the use of the augmentative system, and intensity of teaching input, may also be crucial.

Chapter 18. Subject Selection

It was decided to include in the study two groups of nonverbal cerebral palsied children - a group of 20 children who were learning Blissymbols, and a group of 20 children who were learning BSL (Makaton), in the schools they attended. It is recognized that the use of manual sign language requires a degree of muscle coordination and manual flexibility not often found among individuals with cerebral palsy. However, in practice there are quite a number of cerebral palsied children who are taught BSL (Makaton), including those with hemiplegia and with mild to moderate degrees of physical handicap. It is from this pool that the Makaton Signers included in the present study were drawn.

The criteria for including children in the study were as follows:

1. The child was diagnosed as cerebral palsied, defined as a disorder of motor function resulting from a non-progressive defect or lesion above the brain stem (Rutter, Graham and Yule, 1970). In practice, the diagnosis was obtained from the child's medical records, and had in each case been made by a paediatrician.
2. The child was aged between 3½ and 9½ years, and thus came within the age range of the assessment measures that were to be used.
3. The child was essentially nonverbal, defined as having no more than 30 intelligible spoken words. It must be stressed at this point that while all subjects were handicapped in verbal expression, this handicap stemmed from a variety of sources and was in many cases more, or other, than a purely motor disorder affecting control of the speech musculature. Other possible contributory factors included mental handicap, hearing defects and developmental language disorders. As a result, many of the children also had difficulties in learning to comprehend spoken language.
4. The child was being taught either Bliss or BSL (Makaton) at the school he/she attended, and had been exposed to the system for not more than 1½ years prior to commencement of the study. This time limit was introduced because of the intention of documenting progress from the early stages of symbol/sign acquisition. It was initially intended to examine the children on their very first exposure to the augmentative systems and then to follow up their progress at regular intervals. However, preliminary

visits to special schools indicated that in any one year relatively few cerebral palsied children are first exposed to such systems.

No IQ specifications were laid down for subject selection, as it was hoped that a wide range of intelligence in the subjects would allow for evaluation of the role of intelligence in the acquisition of Blissymbols and BSL (Makaton).

The procedure undertaken in gathering the sample was as follows:

The head teachers or speech therapists of special schools (ESN(S), ESN(M) and PH Schools, as well as Hospital Schools and special units attached to ordinary schools) were contacted by telephone; the aims of the study were explained to them and inquiries were made about the presence of pupils who might fulfil the above criteria. A total of 121 special schools and units were contacted, all of which were either in London or within commuting distance from London. They comprised 44 PH Schools, 60 ESN(S) or ESN(M) Schools, and 17 Hospital Schools, mixed handicap schools and special units in ordinary schools. Of these, 36 schools indicated that they were likely to have suitable candidates who were learning Bliss or BSL (Makaton), and all but 2 schools indicated their willingness to participate in the project. Visits were then undertaken to these schools to obtain further information about the children, to meet the school staff, and to discuss the implications of their involvement in the project. The first 20 BSL (Makaton) Users and 20 Blissymbol Users identified who fulfilled the selection criteria, comprised the sample. These children came from a total of 21 special schools or units. Once the cooperation of all relevant school staff was obtained (head teachers, teachers and speech therapists), letters were sent to the children's parents detailing the aims of the study and requesting their consent and cooperation. All parents agreed to the inclusion of their children in the project.

Chapter 19. Procedure

The psychological assessment of cerebral palsied children is, for a variety of reasons, fraught with difficulties. The children tend to have a very limited span of interest, and they may tire easily because test procedures are likely to require more effort of them than of non-handicapped children (Russel, 1984). There may be additional difficulties in establishing rapport and in motivating the children in a test setting, as well as in explaining the nature of the assessment tasks and ensuring the comprehension of instructions (Kiernan and Jones, 1982; Stephen and

Hawks, 1974). Added to this, there are few suitable test procedures for the assessment of language impaired physically handicapped children such as those constituting the present sample. The motor, speech, visual and auditory difficulties of such children severely limit the applicability of most standardized tests which are available for use. Intelligence tests such as the Wechsler Intelligence Scale for children - Revised (WISC-R) (Wechsler, 1974), for example, although comprehensive and well standardized and validated for normal populations, have not been standardized on deviant populations. Such tests involve motor manipulations, verbal responses and timed tasks, which clearly place the nonverbal cerebral palsied child at a severe disadvantage. One typical approach to the assessment of the physically handicapped child has consequently involved adaptations of existing instruments, to make them more suitable for such children (Barnett, 1982). For example, Sattler and Tozier (1970) suggested modifying parts of the Stanford-Binet and the WISC by altering the test stimuli or the required test responses (e.g. requiring pointing rather than verbalizing). The difficulty here of course is the resulting inapplicability of the existing test norms, and validity and reliability data. Nielson (1971) examined the stability of IQ scores of cerebral palsied children who were given such modified tests (including the Stanford-Binet and WISC). She found that after a mean interval of 4 years more than 45% of tested subjects changed by more than 10 IQ points. Particularly large discrepancies were found among younger children and among those with associated sensory handicaps and speech disorders. While similar large changes in IQ scores over time have been reported for normal children (e.g. Hindley and Owen, 1978), these tend to be over much longer time intervals (10 to 15 years).

Some of the problems inherent in adapting existing tests can be avoided by using assessment instruments which have been designed specifically with the physically handicapped in mind - tests which are untimed and require no verbal response and a minimal motor response, and so do not penalize the nonverbal cerebral palsied child. Tests meeting these requirements are typically selection tests, requiring simple hand or eye pointing responses to multiple-choice problems. Because of the severe communication and physical handicaps of the children included in the present sample, the use of such untimed selection tests was considered essential.

However, it must be stressed that even the administration of such assessment measures is not straightforward. Test responses may be by finger pointing or by gross arm movements. But for severely motorically impaired individuals the only reliable responses may be eye pointing, i.e. indicating the selected response by looking at the item. As Reynell (1970) states, some eye control is usually possible even in the most severely handicapped children, although this may not be easy, and demands careful observation on the part of the examiner. The children must be positioned so that their eyes can be carefully watched, and the test objects or pictures must be so spread out in front of them that visual selection can be observed, but also that the items are all within the children's span of visual attention. Reynell adds that with children who have good eye control there is usually a brief scanning of all objects, followed by a fixation of the one selected. She recommends that the examiner should be quick to reinforce the response, so that the child knows that this mode of communication is effective. On the other hand, the examiner must be careful not to arrest scanning at the appropriate item by reinforcing the response too quickly, since the child may learn to scan by pausing at each item until the selection is made for him by the examiner. Eye pointing responses can be rather fleeting, and without sensitivity the interpretation of such responses can be extremely unreliable. The tester may, for example, miss a particular eye pointing response and ask the child to repeat it. The child may, however, misconstrue such a request as an indication that the original choice was wrong, and so seek another response item. Even greater difficulty is likely to be encountered with children with persisting primitive reflexes, who cannot coordinate hand movements and eye gaze (Reynell, 1970). Such children may try to reach out to an item, their eyes will then lose focus and the resulting arm movement will go astray. In such cases Reynell advises gently restraining the arms, and training the child to respond only with the eyes. Difficulties in accurate eye or hand pointing may be further exacerbated by difficulties in maintaining sitting posture and head position. Where the child's head is not properly supported, the tester may need to call on an additional person to support the child's head before testing can proceed.

If eye pointing is felt to be particularly unreliable, an alternative is to adopt a scanning approach, in which the tester points to each test item in turn until the child signals which is the correct one. The child can respond with any signal of which he/she is capable. Where this approach is used, the present writer has found it useful to scan the item choices on a given task twice with the child, the first time to make sure the child looks at all the options available, and the second time so that the child can indicate his/her choice. This is often a slow and rather laborious process, and the child may get bored and 'switch off'. Ensuring continued motivation under such circumstances can be helped by keeping testing sessions short and giving a great deal of reinforcement. The present writer has also found that as tasks become more difficult and children become less certain of the correct response, they tend to become more reliant on cues given out by the examiner. The examiner must therefore guard against any behaviour which may give the child a cue to a particular item (for example changes in tone of voice or gestures as he/she scans a given array, or looking at the item which is the correct answer). Language impaired and handicapped children are often very sensitive to the nonverbal behaviours emitted by others, and may be quick to pick up even such slight cues to the item that should be chosen.

A major difficulty with the pictorial selection tests, with which eye or hand pointing responses can be used, is that although they were designed specifically with physically handicapped children in mind, they have been standardized only on non-handicapped populations. Another major drawback of these tests is that they are typically much less comprehensive than general intelligence tests such as the WISC-R (Wechsler, 1974). They frequently assess only a limited range of abilities (for example vocabulary, or the ability to identify specific objects), and may be particularly sensitive to visuo-spatial disorders (Coop, Eckel and Stuck, 1975). As a result, writers have stressed the need for the judicious selection and combination of a wide <u>variety</u> of assessment measures, in order to obtain a more comprehensive picture of the capabilities of the children studied (Nicholson, 1970).

In line with this recommendation, the present study employed a wide range of procedures designed to assess the subjects' abilities and progress. These include: 1. Standardized selection tests evaluating various linguistic dimensions, cognitive abilities and perceptual skills. As these are not standardized on cerebral palsied children, the resulting standardized scores or age equivalents, where quoted, must be regarded with extreme caution. 2. Developmental scales, where major developmental achievements are sampled through an adult informant. Again, there are no suitable scales standardized on physically handicapped populations. And 3. Less formal procedures, including parent and teacher questionnaires, and directed behavioural observations and recordings. A second reason for the inclusion of such a large number of different measures is that there is as yet very little indication in the literature as to which variables may be important in augmentative system use. It was therefore felt that a broad spectrum of measures needed to be included. It must, however, be stressed that these are not simply a 'rag-bag' of instruments indiscriminately thrown together. The measures were carefully selected to cover those areas which seem to be relevant, both intuitively and on the basis of indications from past studies.

The children were assessed upon commencement of the study, and then on three further occasions, at six-monthly intervals, over a total period of one-and-a-half years. At each of these four periods the assessments were administered to each child over a number of sessions, spread out over two or three days. As already noted, cerebral palsied children tire easily, and their attention span is likely to be brief. Consequently the length of each testing session was short (usually between 20 and 30 minutes), and varied depending on the concentration and cooperation of each child at a given time. In general, four 20- to 30- minute sessions were required to administer the battery of tests; but for some children five or six sessions were necessary. At each school the assessments were usually carried out in the speech therapy room, or in an empty classroom, and recommendations from the child's teacher or physiotherapist were followed in placing each child in the best position to obtain the greatest comfort and function (e.g. seated in a wheelchair or in a specially adapted or moulded seat, or standing up in splints). The examiner communicated with each child in the mode(s) typically employed in the child's classroom and speech therapy sessions, that is using speech, gestures and Blissymbols or Makaton Signing. These combined modes were also used when giving test instructions, except that symbol use/signing were omitted when these may have given clues to test content (e.g. when administering the speech expression and comprehension tasks).

Lastly, questionnaires were completed by teachers or speech therapists, and by parents, also at six-monthly intervals, to obtain information on the children's communication skills and use of signs/symbols at school and at home.

The specific assessments undertaken at each time period are now described.

19.1 Assessment of Cognitive Abilities

A. The Columbia Mental Maturity Scale (CMMS) (Burgemeister, Blum and Lorge, 1972):

The CMMS is described as a nonverbal measure of 'general reasoning ability'. This test is particularly suitable for physically handicapped children since it is untimed and responding is not dependent on verbal ability or fine motor skills. The scale was designed for children aged 3.06 to 9.11 years, and consists of 92 pictorial and figural classification items arranged in a series of 8 overlapping levels. Each level contains from 51 to 65 items, and the child takes the level appropriate for his/her chronological age. Each item consists of 3 to 5 drawings presented on a card, and the child is asked to select the picture or figure which 'does not belong with' the others. For younger age levels, the differences are in terms of colour, size and form, while at the older age levels the child is required to recognize more subtle and abstract differences among the drawings. Since the children take different sets of items depending on their ages, raw scores on the test are not directly comparable. However, the CMMS yields Age Deviation Scores (ADS) - standard scores having a mean of 100 and a standard deviation of 16, which are comparable regardless of age or the CMMS level administered. An ADS was computed for each child in the present sample, but because the test does not discriminate scores below an ADS of 50/55, the children were also assigned interlevel standard scores from the test manual. These range from 174 to 462, with a mean of 300 and a standard deviation of 30, and are useful in examining the relative performance of various age groups in terms of a continuous scale which presents individual scores even at the lower end of the scale.

The 1972 revision of the CMMS was standardized on a representative sample of 2600 American children. Unfortunately, handicapped children were not included in the standardization sample. The assignment of standardized CMMS scores to the present sample must thus understandably be accepted with reservations.

The test manual (Burgemeister, Blum and Lorge, 1972) reports a median split-half reliability coefficient of 0.90, and a median test-retest reliability coefficient, 7 to 10 days apart, of 0.85, with an average gain of 4.6 IQ points on the retest. Pascale (1973) also found a test-retest reliability coefficient of 0.85 for a group of preschool children re-tested after 7 days, while Riviere (1973) found a test-retest reliability coefficient of 0.93 over 35 days for a much older group of institutionalized mentally handicapped children. These data suggest that the CMMS has good reliability, at least when used with physically able children.

Although the test is purported to measure general reasoning ability, it would appear to be fairly limited, since performance is based entirely on one type of item. The validity data reported in the manual for non-handicapped children consist of correlations ranging from 0.31 to 0.61 between the CMMS and scores on a standardized achievement test, and correlations in the 0.60s between the CMMS and IQ tests. Riviere (1973) found similar significant but moderate correlations with the Stanford-Binet and Wechsler Intelligence Scale for Children (WISC) in a group of mentally handicapped adolescents. Other validity studies were conducted with normal and mentally handicapped children using earlier editions of the CMMS. In these studies, too, correlations between the CMMS and measures of ability and achievement (which included the Raven's Coloured Progressive Matrices, Stanford-Binet, WISC and reading tests) ranged from 0.40 to over 0.60 (e.g. Barratt, 1965; French and Worcester, 1956; Garnett, 1968; Levinson and Block, 1960; Smith, 1961). Somewhat higher correlations with measures of IQ and school achievement have been reported for cerebral palsied subjects. Coop, Eckel and Stuck (1975) found that the CMMS correlated 0.74 with a teacher rating of school achievement, and 0.88 with French's Pictorial Test of Intelligence (French, 1964). Using earlier versions of the CMMS with cerebral palsied subjects, Berko (1955), Dunn and Harley (1959), Gallagher, Benoit and Boyd (1956) and Nicholson (1970) found correlations ranging from 0.60 to 0.93 between the CMMS and such measures as the Stanford-Binet, the Leiter International Performance Scale, Raven's Coloured Progressive Matrices and teacher rankings of arithmetic and reading. On the other hand, there is some suggestion in the literature that the CMMS, requiring as it does perception of similarities and differences between visual arrays, may underestimate the IQs of handicapped children (including cerebral palsied, autistic and mentally handicapped children) by between 10 and 20 IQ points, perhaps because of the visual-perceptual problems which characterize many of these children (Bartak, 1977; Nicholson, 1970; Riviere, 1973). As Bartak points out, the interpretation of such findings is hampered by a lack of knowledge of exactly what the test is measuring; but the implication is for caution in accepting CMMS Age Deviation Scores for such groups.

Despite the above reservations, the CMMS was selected for use in the present study in view of its suitability for assessing physically handicapped children, and in view of the high correlations found in a number of past studies between this test and measures of ability and achievement in groups of cerebral palsied children. It must be noted that while Burgemeister, Blum and Lorge (1972) claim that the CMMS can be administered in 15 to 20 minutes, it required approximately 40 minutes to administer the test to the severely physically handicapped children used in the present study (generally in two consecutive 20-minute sessions). In view of the length of the test, and the fact that it became tedious and repetitive for many of the subjects, it was administered only at baseline, and was not repeated during the follow up testing periods.

B. Raven's Coloured Progressive Matrices (CPM) (Raven, 1977):

The CPM consists of 36 designs comprising Sets A, Ab and B, with 12 designs in each set. One section of each matrix design is missing and the child is asked to complete the design by choosing from 6 alternative parts of the matrix printed below the main design. The test is described by Raven (1977) as a measure of 'observation and clear thinking', and was designed to assess the chief cognitive processes of children prior to the stage in which the intellectual capacity to reason by analogy is used as a consistent mode of inferential thinking. Raven intended the test for use with intellectually normal children under 11 years of age, and with mentally handicapped children. He considered the test to be a measure of general visual/perceptual reasoning, free of acquired knowledge and verbal content. Like the CMMS, the CPM is particularly suitable for physically handicapped children since it is untimed, requires minimal verbal explanation, and the subject's response may be limited to hand or eye pointing, or gesturing yes/no in response to alternatives being indicated by the examiner.

The test was standardized on a sample of 608 Dumfries children aged 5½ to 11 years, and a further group of mentally handicapped children. It yields percentile grades for children in these age groups, and there are extrapolated norms for children aged 3½ to 5 years. Unfortunately, the test has not been standardized on physically handicapped children.

A wide variety of reliability values have been reported for the CPM in different studies, using both normal or mentally handicapped children. Split-half reliability coefficients range from 0.60 to 0.93, and test-retest reliability coefficients range from 0.43 to 0.92 over periods of 1 week to 2 years (Carlson and Jensen, 1981; Freyberg, 1966; Jensen, 1974; Pascale, 1973; Raven, 1977). As expected, reliabilities tend to be lowest for younger children (aged 5½ to 6½ years) and over longer test-retest intervals. On the question of validity, too, a wide range of results have been reported. It is argued that the CPM does not measure a variety of aspects of cognitive functioning, and a few studies report weak correlations with intelligence tests such as the WISC and CMMS, and with measures of school achievement, for normal, mentally handicapped and deaf children (e.g. Georgas and Georgas, 1972; Mueller, 1969; Pascale, 1973). On the other hand, many other studies report relatively high correlation coefficients between the CPM and measures of school achievement and IQ (including the WISC, the Leiter International Performance Scale, The Metropolitan Achievement Test, and teacher ratings) (e.g. Bentley, 1976; Orme, 1961, 1975; Ritter, 1976; Wilson, Rapin, Wilson and Van Denburg,1975). Factor analyses of batteries of tests show the CPM to load highly on a factor identified as general intellectual ability (Frank and Fielder, 1969; Macarthur, 1960), although in Frank and Fielder's study the test also loaded on perceptual speed and apprehension of figural similarities. Nicholson's (1970), and Richardson and Kobler's (1954) studies are among very few which report use of the CPM with cerebral palsied children. They found correlations of between 0.74 and 0.94 with the Stanford-Binet and CMMS, but (as is also the case with the CMMS) they argue that the CPM underestimates the intelligence of these children. This may well be because it is strongly dependent on visuo-spatial skills, which may be deficient in cerebral palsied children.

In view of these latter considerations, and bearing in mind the lengthy assessment battery used in the present investigation, it was decided to administer only Set A of the CPM, which has been found by Wiedl and Carlson (1976) to be less difficult for normal children than either Set B or Set Ab. Set A involves problems requiring simple continuous pattern completion, pattern completion with change in one direction, and pattern completion with change in two directions (Wiedl and Carlson, 1976). Because the whole test was not administered, percentile values could not be calculated, and each subject's performance was expressed in the total number of problems correctly solved out of the 12 Set A items. As changes were unlikely to show up on this short test after six-monthly time intervals, it was administered only at baseline and final follow up.

C. Perceptual Skills:

1. Frostig Developmental Test of Visual Perception (DTVP) (Frostig, 1966):

Visual perceptual skills are likely to be critical in relation to sign and symbol learning. Assessment of these skills was considered to be especially relevant in the present study in view of the fact that perceptual and visuo-spatial handicaps are among the most commonly encountered learning difficulties of cerebral palsied children (Reynell, 1970). The Frostig DTVP was selected for use since, unlike conventional intelligence tests, it focuses on the specific area of visual perception, and is widely used for the identification of perceptual handicaps which are presumed to contribute to difficulties in acquiring academic skills, at least in the early school years (Tew, 1976). However, many questions have been raised concerning the assumptions underlying the test and its validity in an educational context (see below), as a result of which the use of this test must be approached with considerable caution.

The DTVP consists of 5 subtests seeking to measure 5 operationally defined perceptual skills, as follows: Test I: Eye-motor coordination - a test requiring the drawing of continuous lines between boundaries of various width, or from point to point, without guidelines. Test II: Figure-ground - this test involves tracing around intersecting and hidden geometric forms, requiring shifts in perception of figures against increasingly complex grounds. Test III: Constancy of Shape - a test involving the recognition of certain geometric figures presented in a variety of sizes, shadings and positions, and their discrimination from other geometric figures. Test IV: Position in Space - involving the discrimination of reversals and rotations of figures presented in a series. Test V: Spatial Relationships - a test consisting of lines of various lengths and angles which the child is required to copy, using dots as guide points. The DTVP was standardized on 2100 American children aged 3 to 9 years (Maslow, Frostig, Lefever and Whittlesey, 1964). Norms were developed using the concept of perceptual age level, whereby the level for each subtest was defined in terms of the performance of the average child in the corresponding age group. Tables are available for these measures to be converted to scale scores, and an overall perceptual quotient can be obtained. However, the standardization sample was biased in terms of geographical area, its overwhelmingly middle class nature, and the absence of handicapped children.

Test-retest reliability studies were carried out on normal children tested two weeks apart (Maslow et al., 1964), and some rather low subtest reliability coefficients (ranging from 0.29 to 0.80) were ascribed to the rapid temporal development of visual perception. However, the test-retest correlation coefficient for a derived perceptual quotient was 0.80, and the split half reliability coefficient for a 5- to 6-year age group was 0.89. Test-retest reliability for a group of 50 children with learning difficulties tested three weeks apart was considerably higher ($\underline{r}$ = 0.98) (Maslow et al., 1964). Validity was investigated through correlations with teachers' ratings of classroom adjustment ($\underline{r}$ = 0.44), motor coordination ($\underline{r}$ = 0.50), and intellectual functioning ($\underline{r}$ = 0.50), using a large kindergarten sample. Frostig (1966) further claimed correlations of between 0.40 and 0.50 with first grade reading achievement, but much lower correlations with reading achievement in the higher grades. Chissom, Thomas and Collins (1974) found correlations of 0.67 and 0.79 with academic measures. On the other hand, Smith and Marx (1972), Colarusso, Martin and Hartung (1975) and others found no support for the claim that DTVP scores correlate with measures of school achievement.

Frostig (1966) assumed that the subtests of the DTVP tap five different and essentially independent visual perceptual abilities. However, the literature on the test reports that between one and three principal components isolate most of the subtests factorially (e.g. Allen, 1968; Becker and Sabatino, 1973; Corah and Powell, 1963; Silverstein, 1965; Thomas and Chissom, 1973; Ward, 1970). These studies fail to support Frostig's claim for orthogonality of the subtests. A number of studies have further reported significant correlations between the DTVP and IQ scores (e.g. Yule, Berger, Butler, Newham and Tizard, 1969), which may call into question the use of the Frostig as a test of Perceptual Development without first partialling out the effects of general intelligence.

Despite the above drawbacks concerning the reliability and factorial structure of the Frostig DTVP, the test was included in the present assessment battery because of its emphasis on visual perceptual skills, and in the light of findings in a number of studies of positive correlations with classroom adjustment, motor coordination and reading achievement, and negative correlations with learning difficulties and neurological handicaps (e.g. Frostig, 1963; Sand, Taylor, Rawlings and Chitnis, 1973). As it stands, the test is a pencil-and-paper test and is only suitable for children who have adequate manual control. However, Subtests III and IV (Constancy of Shape, and Position in Space) can be given to severely physically handicapped children by having them indicate the required items through hand or eye pointing responses. These two subtests, which also have the highest test-retest reliabilities as reported by Maslow et al. (1964), were therefore the only ones used in the present study. For each of these subtests three scores were derived - a raw score (the total number of items correctly indicated), a perceptual age score (defined in terms of the performance of the average child in the corresponding age group for each subtest), and a scale score (with a score of 10 set equal to the mean for each age group). It must, however, be stressed once again that since the test was standardized on a biased, physically able sample, and since the present investigator accepted pointing responses where pencil outlining was not possible, the obtained perceptual ages and scaled scores must be regarded with care.

2. Pre-symbol Assessment (Davies, 1980):

This measure assesses the child's response to a variety of symbols. The first 18 items require the child to match geometric shapes, some of which are Blissymbols. The child is then asked to locate 8 Blissymbols according to their function (e.g. "Which one do you SEE with"), while the final section requires recognition of 8 pictorial symbols in response to a verbal label (e.g. "Show me HOUSE"). The child's performance is expressed in the total number of correct responses out of the 34 test items. The instrument was developed at the Blissymbolics Communication Resource Centre (U.K.) with the aim of helping teachers to determine whether a nonverbal individual can relate to symbols, i.e. whether the teaching of a symbol system would be appropriate for a given individual. There are as yet no published data on the use of this instrument, and it was included in the present study with the aim of determining its relationship to other measures of ability and to progress in symbol and sign system use.

D. Picture Aided Reading Test (P.A.R.T.) (Hamp, 1975):

The P.A.R.T. is a test of written word recognition. It was devised as a means of assessing the reading ability of deaf and partially hearing children, but since performance does not depend solely on verbal expression, it is also particularly suitable for use with other speech impaired populations, including nonverbal cerebral palsied children.

The test booklet consists of 55 items, each item consisting of a printed word which the child has to read aloud. The tester then turns the page and the child is required to indicate one of a series of four pictures which illustrates the meaning of the word. For children with poor articulation or no speech, the selection of the correct picture illustrating the word to be read is the only way the tester determines that the child can both read the word and comprehend its meaning. The test covers the earliest stages of reading, progressing to a Reading Age of 10 years. In calculating reading ages an allowance is made to correct for scores gained by random success. Although the test was devised for deaf children, it was standardized on a sample of 2,279 hearing children aged 5 to over 11 years.

The test manual reports a split half reliability coefficient of 0.97 for hearing children, and a test-retest correlation coefficient of 0.98 for a group of deaf and partially-hearing children tested two weeks apart. High correlations (ranging from 0.88 to 0.94) were found with other reading tests, including the Schonell Graded Word Reading Test, for both hearing and deaf/partially-hearing children. Much lower, though significant, correlations emerged with teacher ratings of intelligence. The P.A.R.T. is thus shown to be a valid and reliable measure of simple word recognition for hearing and hearing-impaired children. There are to date no data on the use of the test with nonverbal physically handicapped children.

19.2 Assessment of Physical and Motor Status

A. Diagnosis:

Rutter, Graham and Yule (1970) define cerebral palsy as an unequivocally pathological motor disorder in which there is evidence of a non-progressive lesion above the brain stem. In practice, the children's medical records were referred to in order to verify the diagnosis of cerebral palsy, and to ascertain the sub-diagnostic categories in which the children were classified. The diagnoses had in all cases been made by paediatricians. However, each diagnosis was made by a different paediatrician, and it is therefore important to bear in mind Alberman's caution concerning the frequency of disagreements between diagnosticians in the diagnosis of the motor handicaps in cerebral palsy (1984, in Stanley and Alberman, 1984). As an example, Alberman cites an Australian study which found only 40% agreement between 6 paediatricians and neurologists on the type of motor handicap (spasticity, ataxia etc.), and 50% agreement on the site location (hemiplegia, diplegia etc.).

Hagberg, Hagberg and Olow's (1975) system of classification of cerebral palsy was then followed in grouping the children into diagnostic subtypes. This classification scheme is recommended by Paneth and Kiely for its simplicity and comprehensiveness (1984, in Stanley and Alberman, 1984). According to the scheme, cases were divided into three primary diagnostic groupings: spastic syndromes, dyskinetic syndromes and ataxic syndromes. The spastic group was further subdivided according to the anatomical distribution of the paralysis to include diplegia, quadriplegia and hemiplegia. In addition, a 'mixed' category was used, which allowed for the classification of those children showing combinations of the above types of disordered movement. Hall (1984) has pointed out that the movement problems exhibited by some cerebral palsied children, particularly infants or young children, are sometimes hard to classify into these traditional categories of cerebral palsy. A final category of 'other' was therefore included to cover such cases.

B. Vision, Hearing and Epilepsy:

Information on hearing loss, visual acuity, and the presence of visual defects was obtained from the children's medical case notes. It is of course recognized that the testing of vision and hearing in the children may, in some cases, have been inadequate or incomplete.

Visual acuity was categorized according to the following criteria:

1. Blind-visual acuity in the better eye of $3/_{60}$ or less. 2. Partially sighted-visual acuity in the better eye of between $4/_{60}$ and $6/_{24}$. 3. Sighted-visual acuity in the better eye of $6/_{18}$ or better (Henderson, 1961). The presence of strabismus, nystagmus and other visual defects was also noted.

Extent of hearing loss in the better ear was expressed by groupings on the decibel scale as follows: 1. Profound-hearing loss beyond 85 dB. 2. Severe-hearing loss of 60 to 85 dB. 3. Moderate-hearing loss of 40 to 60 dB. 4. Mild or none-hearing loss of under 40 dB. (Holt and Reynell, 1967). A fifth category was included to cover cases where hearing could not be tested because of the child's inability or unwillingness to co-operate in testing. The presence/absence of high frequency hearing loss was also noted.

The child's parents were asked to provide information on whether the child had had any fits or convulsions in the first two weeks after birth; whether the child had had one or more fits after the age of two weeks; whether the child had had one or more fits in the year prior to the study; and whether the child was taking anticonvulsant medication. Where children had had one or more fits after the age of two weeks, the parents were asked to describe the form the fits took and their frequency.

C. Rating the Severity of Physical Handicap:

Each child was rated on the degree of severity of handicap, according to criteria provided by Rutter, Graham and Yule (1970). Handicap was assessed on the extent to which the child's disability interfered with his/her daily life. As Rutter et al. point out, in the case of multiple handicaps it is rarely possible to assess exactly which disability leads to which handicap. Attention was therefore confined to the actual restriction of activities, regardless of whether they seemed to be due to mental, physical, or motivational factors. Rating of handicap ranged from 'no handicap', through 'slight', 'moderate' and 'severe' handicap to 'total or almost total incapacity'. The specific criteria for rating each category are presented in Appendix 3. The reliability of the scale was assessed in the Isle of Wight study by two raters independently rating handicap in 44 physically handicapped children, aged 10 to 12 years. The overall level of agreement was satisfactorily high (88.6 per cent), and was equally good at all points on the scale (Rutter, Tizard and Whitmore, 1970).

D. Assessment of Postural Control, Mobility and Agility:

In addition to the general indices of physical and motor status described above, it was necessary to obtain more detailed measures of motor development and disability. Unfortunately, there is no test of motor function available that does justice to the basic definition of cerebral palsy as a disorder of movement and posture, where the mere persistence of infantile motor control is not considered to be cerebral palsy (Ingram, 1984). Tests such as the modified Oseretsky Test of Motor Proficiency (Bruininks and Bruininks, 1977) were not suitable since they were not designed for the population, and furthermore the majority of the children included in the present study were too physically handicapped even to attempt many of the items on such tests. The present writer therefore resorted to the use of checklists of gross motor control, including measures of postural control, mobility and agility.

The checklists specify behaviours to be observed; however, it must be said that cerebral palsied and developmentally delayed children frequently do not qualitatively demonstrate behaviours specified on most checklists. Such checklists focus on terminal responses and do not describe the types of movement patterns used to perform a given response. Campbell (1979) gives a typical example of a checklist item which specifies that the child drinks from a cup without losing liquid from the mouth. The normal child would perform the skill with the cup between his/her lips and by using typical tongue patterns to take the liquid into the mouth and to swallow. The cerebral palsied child may also drink without losing liquid; but he/she may place the cup under the teeth, bite the edge of the cup, and use tongue thrusting or protrusion to retrieve the liquid. Checklist items imply normal patterns of movement, but do not generally operationally define these patterns in ways that make the checklists valid or reliable with motor dysfunctional children. As such, the checklists described below have been used only to give a general indication of motor tasks which the children can and cannot perform.

The assessment of postural control consisted of checklists for Locomotion, Head Control, Sitting and Standing, which were derived from Kiernan and Jones' (1982) Behaviour Assessment Battery. In the present study these checklists were completed by the child's teacher or speech therapist. The criteria for scoring the checklists are presented in Appendix 11, Questions 1 to 4. The Behaviour Assessment Battery was specifically designed for assessing the abilities of profoundly mentally and multiply handicapped children; however, no information is available on the reliability or validity of these scales.

The Mobility and Agility scales of the Progress Assessment Chart (P-A-C) (Gunzburg, 1977), were used to provide further indices of motor ability. There are 3 basic P-A-C forms and 3 special P-A-C forms, constituting an assessment of the developmental status of mentally handicapped children and adults of varying ages and intelligence levels. Gunzburg also provides Progress Evaluation Indices which give information relating to the 'average achievement levels' in the various subsections of the P-A-C, enabling a comparison of an individual's performance with that of children or adults with a similar degree of mental handicap. Items from the Mobility and Agility scales of forms P-P-A-C (designed for mentally handicapped children aged up to 7 years, or older children presenting with severe problems of management) and P-A-C-I (designed for mentally handicapped children aged 6 to 16 years or older) were selected. The items are placed more or less hierarchically with respect to one another. However, it must again be stressed that the items are not based on motor development sequences in physically handicapped individuals. As already noted, the development of the cerebral palsied child does not follow normal patterns or, for that matter, the patterns exhibited by mentally handicapped children. Furthermore, there are no reliability or validity data on the use of the Mobility and Agility scales, even with mentally handicapped children. The two checklists, which are presented in Appendix 4, were completed by the children's teachers or (where available) physiotherapists. Mobility and agility scores were calculated in terms of the number of items passed in each category, out of a total of 13 Mobility scale items and 20 Agility scale items.

E. Assessment of the Functioning of the Oral Musculature:

The child's ability to produce normal speech is dependent in part on the motor functioning of the speech apparatus. In the present study, degree of control of the speech musculature was assessed in three ways:

1. Firstly, by asking speech therapists to make a judgement on the extent of involvement of the oral musculature in each child's speech difficulties, using a 4-point scale ranging from 'very severe impairment' to 'slight or no impairment' of the speech musculature. This scale was devised by the present writer, and is presented in Appendix 11, Question 5a. Data on the validity of the scale, in terms of its association with the ability to co-ordinate tongue movement, feeding difficulties, and speech sound production skills, will be presented in a later chapter.

2. A screening test recommended by Rutter, Graham and Yule (1970) was used to assess the co-ordination of tongue movements. The child was asked to waggle his/her tongue quickly from side to side so that it touched the corners of the mouth; and then to lick the upper lip. In

each case these movements were first demonstrated by the examiner. Following Rutter et al.'s procedure, separate codings were made for each of these two items. To score '0' (normal) on side to side movements, the movements had to be fairly brisk and well co-ordinated. To score '0' on licking the top lip, the child's tongue had to perform an upward curl. 'Slight' (1) and 'marked' (2) abnormalities were differentiated in the coding. Rutter et al. reported overall agreements of 91% and 85% on rating these two items in a general sample of 10- to 12-year-old children on the Isle of Wight, and 81% and 59% overall agreement respectively in a sample of physically handicapped children. These signs were thus rated reliably in non-handicapped children, but much less so in physically handicapped children - probably because of the greater difficulty in assessing these movements when there was tongue weakness or gross generalised co-ordination difficulties. However, the present writer found higher per cent agreements on these items between two raters who assessed tongue movements in 10 cerebral palsied subjects. Overall agreement for side to side movements was 90%, and the chance corrected per cent agreement measure, kappa, had a value of 0.85. For licking the upper lip, too, there was 90% overall agreement between the two raters, with a kappa value of 0.82.

3. The third method of assessing control of the speech musculature was by inference from the ability to eat and drink normally. A number of writers, including Ferrier and Shane (1983), assert that the use of the oral musculature for speech depends on its previous successful use for feeding, including sucking, swallowing and chewing. Feeding is said to show a developmental evolution from an obligatory system of life sustaining reflexes to a system of voluntary control of the oral musculature, upon which speech movements will later be built. Feeding difficulties are thus expected to predict later oral speech difficulty. In support of this contention, both Jones (1975) and Love, Hagerman and Taimi (1980) found a suggestive positive relationship between feeding problems and speech difficulties in groups of cerebral palsied subjects. In the present study, speech therapists or teachers were asked to rate the current feeding abilities of the child in terms of chewing, swallowing, lip closure, sucking, licking and blowing skills. An additional item was included in this section concerning breathing. For each item, the speech therapist was asked whether the motor pattern was typically performed by the child with no difficulty, with some difficulty, or only with great difficulty. The specific items assessed are listed in Appendix 11, Question 5b, and were derived from Kiernan's Pre-Verbal Communication

Schedule (1981a). On the basis of responses to these 7 items, the child's feeding ability was rated on a 4-point scale, ranging from 'no/slight' feeding problems, through 'moderate' and 'severe' feeding problems.

19.3 Assessment of Language and Communication Skills

Language comprises a complex group of skills and abilities, and assessment must therefore be based on a wide variety of parameters. In the present study attention is focused not only on the comprehension and expression of speech, and comprehension and production of signs/symbols, but also on the assessment of related abilities, including motor imitation, verbal imitation, symbolic play skills, and natural gestural ability. A number of studies (e.g. Blau, Lahey and Oleksiuk-Velez, 1984 ; Prutting, Gallagher and Mulac, 1975) have further suggested that children's performance on formal language tests is not always an accurate reflection of their skills sampled in free expressive language recordings. It was therefore decided to supplement tests of language level with other measures, including recordings of the children's speech and symbol/ sign productions in spontaneous communication settings, and information obtained from teacher and parent questionnaires.

19.3.1 Tests

A. Reynell Developmental Language Scales - Revised (RDLS) (Reynell,1981):

The RDLS were used to provide measures of each child's understanding and use of speech in terms of equivalent age scores. Although in theory signs and symbols can be used together with speech to assess language abilities on these Scales (e.g. Walker, 1973), such an approach would confuse mastery of speech with signs/symbols, and would render the norms inapplicable. In the present study the test was therefore used solely as a measure of speech expression and comprehension.

The test, which was developed and standardized in England, consists of two separate scales which assess verbal expression and verbal comprehension independently. The Expressive Scale aims to elicit samples of the child's spoken language in response to standard materials, and is divided into three sections, each being concerned with a different aspect of language. Section 1 is concerned with the structure of language, and assesses spontaneous expression from the earliest vocalizations to the use of complex sentences. Section 2 assesses vocabulary, and includes the function of naming and the ability to describe word meanings. Section 3 assesses the ability to use speech to express consecutive ideas in describing pictures. In contrast, the Verbal Comprehension Scale (A) requires no spoken response. The child is required to point to objects or pictures which have to be identified or manipulated according to spoken instructions of gradually increasing complexity. There is an alternative form of the Comprehension Scale (B) for use with severely physically handicapped children who have extremely limited or no hand function. All the items in this scale are so structured that they may be answered by a hand or eye pointing selection response. Scale B was chosen for use, since it was particularly suitable for the cerebral palsied children constituting the present sample.

The RDLS cover an age range from 1 year to 7 years. Some of the children in the present study had chronological ages above the ceiling of the test; however the selection criteria used to gather the sample ensured that in almost all cases mental ages and language ages were within the age range covered. The scales have been standardized on 1,318 children from London and the South East of England, with a small sample from the North of England. But despite the fact that the test was designed from the outset with the needs of handicapped children in mind, the standardization sample consists only of normal children. The use of Reynell age equivalents must therefore be considered with care.

The only reliability data presented in the manual are split-half reliabilities; these were mostly high, in the range 0.80 to 0.97. No information is provided on examiner reliability or test-retest reliability. There is also little information on the validity of the RDLS in terms of correlations with other measures of language ability and predictive validity. Significant correlations have been reported for normal and autistic children between the Expression and Comprehension Scales and other measures of verbal ability, including the Illinois Test of Psycholinguistic Abilities (Silva, Bradshaw and Spears, 1978), the Carrow Elicited Language Inventory (Howell, Skinner, Gray and Broomfield, 1981), and measures of syntactical complexity obtained from spontaneous speech samples (Cantwell, Howlin and Rutter, 1977; Udwin and Yule, 1982b). Howell et al.further found that the test successfully differentiated between children referred for speech therapy and matched controls. These results suggest that the RDLS is a valid instrument for the assessment of language in normal children, and possibly also in autistic children. However, among a group of language disordered preschoolers, Udwin and Yule (1982b) found only moderate correlations between measures of syntactical complexity of speech and the Reynell Expressive Scale, and no significant relationships with the Comprehension

Scale, suggesting caution in using the test with this group. There are no published studies on the use of the RDLS with physically handicapped children.

A number of criticisms have been levelled at the content and structure of the RDLS. Crystal, Fletcher and Garman (1976) pointed out that the Expressive Scale of the Experimental Edition of the test failed to incorporate certain important linguistic structures into the assessment, that there was no clear rationale underlying the selection of those syntactic features which were included, and that the scoring criteria in the Content Section of the Expressive Scale were very ambiguous. These criticisms are also applicable to the revised version of the test. Further drawbacks are the lack of detail in the assessment at the upper end of the scale, and the fact that a very small range of raw scores covers quite a wide range of ability (Müller, Munro and Code, 1981). For example, on the Expressive Scale only 6 points cover 3 to 2 standard deviations at the age of 4 years. This makes it possible for only small differences in performance to make quite a marked difference in recorded ability. Nevertheless, the RDLS is the only readily available test encompassing verbal comprehension and expression, and is of particular value in the assessment of children whose language development and physical skills are limited. Moreover, it is probably the most commonly used assessment of child language ability in the U.K. For these reasons the Reynell Expressive and Comprehension (B) Scales were included in the battery of tests used in the present study.

B. English Picture Vocabulary Test (EPVT) (Brimer and Dunn, 1973):

The EPVT is an English version of the American Peabody Picture Vocabulary Test (Dunn, 1959), re-standardized and adapted for use with English children. The Full Range version of the test was used, covering an age range of 3 years to 18 years and above. The test consists of 125 sets of 4 pictures. A word is read out for each set in turn, and the child is asked to indicate the picture which corresponds to the spoken word. Raw scores are converted to standardized scores which have a mean of 100 and a standard deviation of 15. Like the CMMS, RCPM and Reynell Comprehension Scale, the EPVT is suitable for use with physically handicapped children since it only requires a hand or eye pointing response. However, as is also the case for these other tests, no norms are provided for handicapped populations.

The manual of the Full Range EPVT provides no information on the reliability or validity of the test (Brimer and Dunn, 1973). Split-half reliabilities quoted for earlier versions of the test, covering more restricted age ranges, varied between 0.87 and 0.96 (Brimer and Dunn, 1966). The test was designed to measure level of listening vocabulary, i.e. the ability to comprehend single words. In the past, claims were made for the EPVT, and for the Peabody Picture Vocabulary Test (PPVT), as measures of general mental ability or general verbal ability. For example, correlations of 0.61 to 0.82 have been reported between earlier versions of the EPVT and such tests as the Stanford-Binet Form L-M, the Vocabulary subtest of the Wechsler Intelligence Scale for Children (WISC), and the Schonell Graded Word Reading Test (Lovell, 1972; Phillips and Bannon, 1968). Similar high correlations were found in American studies of cerebral palsied children, between the PPVT and general ability tests such as the CMMS, French's Pictorial Test of Intelligence and the Verbal Scale of the WISC (e.g. Ando, 1968; Coop, Eckel and Stuck, 1975; Irwin and Korst, 1967). Citing a number of American studies on the PPVT, Darley (1979) quoted median correlation coefficients with the Stanford-Binet and WISC of about 0.70. However, other studies suggest that EPVT and PPVT results must be interpreted with caution, and that use of the PPVT with mentally handicapped and cerebral palsied children usually yields IQ equivalents higher than those found on such tests as the Stanford-Binet, WISC and CMMS (e.g. Darley, 1979; Nicholson, 1970). In view of the mixed results obtained in past studies, and the insufficient amount of research on the relationship of the EPVT to other language measures, the use of the test as a measure of general language ability or intelligence is clearly hazardous. As such, the test is interpreted only as a measure of receptive vocabulary.

C. The Symbolic Play Test (Lowe and Costello, 1976):

A close relationship between level of symbolic play and language development has been postulated by a number of writers, including Piaget (1967), Lunzer (1959) and Sheridan (1969). They see the two as manifestations of the same underlying symbolic function, and go on to argue that the development of this symbolic function is an essential element in the emergence of meaningful language. These claims find support in the work of researchers such as Lowe (1975) and Rosenblatt (1977), who outlined major parallels between developments in language and symbolic play in normal children, as well as in findings of impaired symbolic play in groups of children who are handicapped in speech and language (e.g. autistic and language disordered children) (Reynell, 1973; Rutter, Bartak and Newman, 1971; Udwin and Yule, 1983). There are very few published descriptions of the representational abilities and symbolic play skills of speech impaired physically handicapped children. To the extent that language development is related to general representation and is dependent upon conceptual development, it was felt to be particularly important to examine the symbolic play skills of the present sample of nonverbal cerebral palsied children, and to assess the importance of these skills for subsequent language development, as manifested not only in the use of verbal language, but also in the use of augmentative systems of communication. It is possible that the identification of symbolic play or symbolic <u>intent</u> in such children would offer indications of their potential for language acquisition when appropriate instructional modes are introduced (i.e. signs or symbols).

Lowe and Costello's (1976) Symbolic Play Test (SPT) was used as a measure of symbolic play skills. This test aims to provide an objectively scored evaluation of a child's spontaneous play in a structured situation. The total play score is defined by a standard checklist as the number of meaningful connections and responses the child is able to make with and between objects presented to him/her. Four sets of miniature toys are presented in a standard arrangement and left for the child's free use. Scoring of the SPT is according to detailed criteria established for each item. Since the test is designed to highlight underlying symbolic processes, the child's intentions are often more important than his/her actions; allowances are thus made for lack of manual dexterity, but not for perceptual errors.

The test has been standardized on normal children aged 1 to 3 years, and a table is provided for converting raw scores to age scores. Physically and mentally handicapped children were not included in the standardization sample. In her results, Lowe (1975) documented a progression from simple identification of a replica to appropriate and inter-related use of the toys, the most significant aspect being the shift from self-related activities to doll-related activities, and the emergence of the doll as agent. Although the children included in the present study are all physically handicapped, and most are considerably older than the children in Lowe and Costello's standardization sample, the SPT was used because it constitutes one of very few standardized play tests that are available, and is simple and quick to administer. Also, the fact that the test is entirely nonverbal, untimed and based on the intrinsic appeal of the material, makes it especially suitable for language handicapped children. Furthermore, two studies have found the SPT to be a useful measure even when used with groups of older children. Whittaker (1980) used the test with profoundly mentally handicapped children aged 7 to 18 years, and found a similar pattern of interaction with the play materials to that described by Lowe (1975); while Udwin and Yule (1982a) found the test to be a reasonably valid measure of symbolic play for 4- and 5-year-old normal and language disordered children.

At present there are very few data describing the SPT. Split-half reliability coefficients reported in the manual for 1- to 3-year-old children were reasonably high, ranging from 0.52 to 0.92 for different age groups. Test-retest reliability coefficients ranged from 0.71 to 0.81 over periods of 3 to 12 months. Correlations between the SPT and two measures of concurrent language ability were rather low (0.28 and 0.31), but correlations with subsequent measures of language ability were higher (0.40 to 0.76), with a tendency for the correlations to rise as the time interval increased. Udwin and Yule (1982a) provided additional validational data on the SPT. They found significant though modest correlations with a measure of imaginative play based on naturalistic observation of free play in both language disordered and normal preschoolers. Moreover, the test successfully differentiated between these two groups of children. There are no reports on the use of the test with physically handicapped children.

The scale of the objects used in the SPT requires a high level of manual dexterity for their manipulation, and, as a result, physical handicaps such as those exhibited by the cerebral palsied children in the present sample would inevitably mask symbolic skills in many of the children. It was therefore necessary to introduce certain modifications in administering the test. In the first place, all the objects were scaled up, since it was reasoned that those children with some hand function would find it easier to manipulate larger-sized toys. However there were some children with minimal hand control who were unable to manipulate even these larger toys. These children were asked to indicate the manipulations they wished to execute by eye or hand pointing, and the examiner then helped them to carry out the desired manoeuvres. The examiner was careful not to pre-empt the child and, in each case, to carry out only those manipulations indicated by the child. This approach was felt to be justified in view of Lowe and Costello's (1976) statement that the child's intentions are more important than the actual actions performed. On the other hand, it must be pointed out that the ability to recognize the small replicas used in the SPT may well be a discriminating factor in the development of symbolic play, which is confounded when the objects are scaled up. The modifications in scaling and in the responses accepted on the test, and the fact that the test was standardized on much younger, physically able children, render the Symbolic Age norms inapplicable. Therefore each child's performance was expressed in terms of the number of meaningful responses made, out of a total of 24 possible responses. Because the SPT was intended for much younger children, the present subjects were expected to score within a narrow range near the ceiling of the test. Significant changes would be unlikely to show up on six-monthly re-testings, and the test was therefore administered at baseline and final follow up only.

D. Verbal and Motor Imitation:

The role of imitation in the acquisition of language has yet to be satisfactorily understood. Indeed, as has been pointed out by Mittler, Jeffree, Wheldall and Berry (1974), it is only in the recent past that imitation has been taken seriously as a psycholinguistic ability, and one worthy of investigation. Earlier views had relegated imitation to a purely mechanical or perceptual-motor skill, only marginally related to 'competence' in the wider sense, or more specifically to language processing (Fraser, Bellugi and Brown, 1963). It is now recognized that imitative skills involve various abilities which are important in cognitive and linguistic development, including the structuring and at least partial comprehension of the material. As such, imitative skills have been described by Piaget (1964), Bates (1976) and others as the sensorimotor forerunners of the symbolic representational skills essential in language development.

In the present study, two types of imitation were assessed - nonverbal imitation of gross and fine motor movements, and verbal imitation of sounds and words. It may be expected that motor imitation skills will have considerable relevance for the ability to perform sequences of learned motor activity such as those needed for signing, while verbal imitation will have more bearing upon speech development. It must of course be recognized that for cerebral palsied children success in these tasks is dependent not only on imitation skills per se, but also on such factors as the adequacy of the oral musculature for phonation and articulation, and physical manipulability of the arms and hands. Imitative skills require finely coordinated motor acts that will be difficult for physically handicapped children, whose motor movements are primarily reflexive and uncontrolled, to perform. Such children may be able to make certain sounds or movements spontaneously, but may become stiff when consciously trying to imitate.

The verbal imitation test comprised 12 single consonant sounds and 12 words, taken from the Verbal Imitation Assessment in Kiernan and Jones' Behaviour Assessment Battery (1982). The sounds and words used are listed in Appendix 5. They were presented verbally by the examiner one at a time, and for each item the child was given a maximum of two attempts at imitating the sound or word. A correct response on either the first <u>or</u> second attempt was awarded one point. A correct response was defined as a sound or sounds that matched the consonant or consonant and vowel segment presented by the examiner. An incorrect response was defined as any sound(s) that did not match the sound or combination of sounds produced by the examiner. An incorrect response was also scored if the child failed to utter any sound. Each child was given a 'sound imitation' score (out of 12 items), a 'word imitation' score (out of 12 items), and a total verbal imitation score (based on the number of sounds and words imitated correctly out of the total of 24 items). Kiernan and Jones (1982) present no reliability or validity data on this measure. In the present study, the investigator and a second, independent judge scored the responses of 13 cerebral palsied children simultaneously. Agreement in scoring was based on item-by-item comparisons, and expressed as the number of agreements divided by the number of agreements plus disagreements multiplied by 100, to give a percentage. An agreement was recorded if both testers had marked either an imitative response or a nonimitative response for a given item. The per cent agreement for each of the 13 subjects varied between 91.7% agreement and 100% agreement, with a mean of 98.7% agreement. Over all 13 subjects, the chance corrected per cent agreement measure, kappa, was 0.972, which was significant at the .001 level. Agreement was also examined for imitation of sounds and words separately. For imitation of sounds, per cent agreement in each of the 13 subjects varied between 91.67% and 100% agreement, with a mean of 98.7% agreement. Overall, kappa equalled 0.974. For imitation of words, too, agreement varied between 91.67% and 100%, with a mean of 98.7% agreement and an overall kappa value of 0.966. Thus both sound and word imitation responses were scored equally reliably in the cerebral palsied children assessed.

A shortened version of Bergès and Lézine's (1965) Imitation of Gestures Test was used to assess the ability to imitate simple arm movements and complex hand and finger movements. This test was originally designed to measure imitation of gestures in premature and neurologically impaired children, and was standardized on a sample of 489 normal children aged 3 to 6 years. These children showed a steady increase in the number of successes on the test with age, and significant but low correlations were found with the Draw-a-Man Test and a puzzle task. A group of 78 children who were born prematurely and/or had neurological disturbances (including cerebral palsy) were found by Bergès and Lézine to score consistently below the norm at each age level. Van Smeerdijk (1981, in Jones and Prior, 1985) used the test with 51 autistic children with a mean age of 6 years 4 months. He, too, found a clear developmental progression of ability, which was consistent with the children's mental ages (i.e at the 2- to 3-year old level). However, Jones and Prior (1985) found that older autistic children, aged 5.09 to 10.06 years, attained lower scores on the test than both mental age and chronological age control groups, suggesting that there may be little further development among autistic children from low levels of imitation ability similar to those of 2- and 3-year-olds. The above results suggest that the test has value in differentiating between normal children and children with neurological handicaps and autism.

In the present study a shortened version of the Imitation of Gestures Test was used. Following the procedure adopted by Butler (1971), 4 items were selected which involved gross arm movements, and 4 items of fine hand and finger movements. For each item the examiner instructed the child to "watch carefully and do exactly what I do". The examiner kept her own hands in the position required until the child seemed satisfied with the movements he/she had made. The child was then instructed to place his hands in a neutral position, and the next test model was presented. The 4 arm movement items used were: 1. Left arm raised vertically, and right arm extended horizontally to the right. 2. Reverse position. 3. Left arm extended directly in front, and right arm raised vertically. 4. Reverse position. The 4 hand and finger movements were: 1. Left hand raised, the index and middle fingers forming a V, the other fingers flexed. 2. Repeated, with the right hand. 3. Right fist closed, index finger of left hand pointing down at the right fist at a distance of about 2 cm. 4. Repeated, reversing hands.

According to the results of Bergès and Lézine, based on a sample of 55 normal children aged 5 years, approximately 15% of subjects would be expected to fail these items. Butler used a pass or fail criterion for scoring each item. However, in the present study each item was assigned a score of 0, 1 or 2, with a score of 2 awarded for a completely accurate immitation of the movement in question, and a score of 1 awarded for an attempt to move both hands or arms into the required position but achieving only an approximation of the terminal response. The maximum score obtainable on the test was thus 16, with a maximum of 8 points for imitation of arm movements and a maximum of 8 points for imitation of hand and finger movements.

Butler used this short form of the Imitation of Gestures Test with 440 normal children aged 4 to 6 years. She found significant but low correlations with the Frostig Test of Visual Perception, a form copying task, measures of fine and gross motor skills, a measure of 'impersistance', and auditory and attention measures. This supports Bergès and Lézine's (1965) claim that performance on the test involves visual perception, some awareness of body image and directionality, and suitable motor coordination ability. Butler further found a test-retest reliability coefficient of 0.67 for a group of 50 children tested 16 to 20 days apart. In the present study agreement in scoring between two examiners was assessed in 10 cerebral palsied children, and was based on item-by-item comparisons. The overall chance corrected per cent agreement value, kappa, was 0.776, which is significant at the .001 level. Examination of per cent agreement on each of the rating values used (0, 1 and 2) showed that a score of 2 was given by the two examiners on 88.9% of occasions, a score of 1 was agreed upon on 81.5% of occasions, and a score of 0 was agreed upon on only 55.6% of occasions. In other words, while the overall per cent agreement for this test was satisfactory, disagreements were at their highest for the children showing the poorest performance.

E. The understanding and Use of Natural Gestures (Bartak and Rutter, 1975):

A factor that may be critical in the acquisition of augmentative communication systems, particularly the manual type, is the learner's ability to comprehend and use natural gestures. Shane (1981) has argued that some nonverbal children may be gesture-oriented, while others may be more picture-oriented. For those children who do use gestures spontaneously, such communicative forms are likely to represent a factor favouring the adoption of sign training. Bonvillian and Nelson (1978), too, recommend that comprehension of pantomime and gesture be used as predictive measures for sign training, since manually produced and visually observed elements of sign and gesture obviously have much in common. Furthermore, there are arguments and some data suggesting that prior to representation through speech there is symbolic representation through nonverbal actions (e.g. Piaget, 1967). In view of such considerations, the testings of competence in gesture was included among the assessment measures used in the present study. It must however be said that procedures for evaluating comprehension and use of gestures are not well established, and it is not yet known which method of testing is likely to be the most appropriate for assessing competence in the use of gesture for communication.

Bartak and Rutter's (1975) test of the Understanding and Expression of Gestures was chosen for use in the present study. Three kinds of materials are used in this test: miniature objects from the Reynell Developmental Language Scale (sock, ball, spoon, brush, cup and car); coloured pictures, similar to those used in the Ladybird series of children's books (pictures of a pencil, comb, knife, broom and spade); and spoken words, selected as activities with which children are most likely to be familiar ("laughing", "washing", "sleeping", "crying", and "eating"). To test <u>expression</u> of gesture, the child was presented with each stimulus and asked "Show me what you do with this". The child was not permitted to touch the stimulus material. In the case of the words, the child was asked to demonstrate the activity (e.g. "Show me washing"). To test <u>understanding</u> of gesture, the child was presented with the array of objects, and then pictures, and told to point to the item belonging to the tester's gesture. For each stimulus (6 objects, 5 pictures, 5 words) a standardized mimed sequence of gestures was devised. The tester mimed each sequence and the child was asked to point to the appropriate object or picture. For the 5 verbal stimuli, the child was given the option of saying the word describing the activity or indicating 1 of 5 pictures corresponding to the mimed sequence. On both sections of the test, scores were the sums of correct responses. However, on expression of gesture, each item was scored 2 points if the gesture was complex and accurately mimed, and 1 point if the gesture was a cruder approximation of the action(s). For example, with the object <u>cup</u>, a momentary vertical raising of the hand in the air scored 1 point, whereas to score 2 points the child needed to raise one or both hands to the mouth and move the head or mouth appropriately in relation to it. The criteria used for scoring each item on the Expression section of the test are described in Appendix 6. The test thus yields two raw scores - a gestural expression score with a maximum of 32 scorable points, and a comprehension of gesture score with a maximum of 16 points.

The only data available on the test to date concern its use with autistic and dysphasic children. Bartak (1977) presented mean scores on the test for two groups of such children, and found that the autistic children achieved significantly lower expression and comprehension scores than the dysphasic children. It must be pointed out that when using the test with cerebral palsied children, performance on the gestural expression section will reflect not only gestural capacity and skills, but also the child's physical and motor status.

F. Rating of Articulation and Phonation:

Each child's speech therapist or teacher was asked to indicate the number of intelligible words the child had, as follows: fewer than 4 intelligible words, 4 to 10 words, 10 to 30 words, or more than 30 intelligible words. In addition, the adult was requested to rate the intelligibility of the child's speech on a 4-point scale, ranging from speech which is understood by anybody and with clear enunciation of most sounds, to speech which is not understood by family and adults who work closely with the child. An additional category was included to cover those children who produced no sounds. This articulation scale was devised by Bartak, Rutter and Cox (1977), and the criteria for each category are described in Appendix 11, Question 7b. The child's speech therapist or teacher was also asked a series of questions concerning the child's ability to produce sounds (e.g. "Can the child make throaty noises or grunts or moans"; "Can the child make vowel sounds"; "Can the child combine two different sounds"). Each item was rated as occurring usually (2 points), occasionally (1 point), or never (0 points), and a total score for the development of sounds was obtained by summing across all items, with a maximum score of 14 points (see Appendix 11, Question 6). Such information may be valuable in determining the child's potential for spoken language. In this regard, Horstmeier and MacDonald (1978) found that children who already made a variety of sounds learned to use spoken vocabulary items more quickly than nonvocal children.

19.3.2 Number of Blissymbols/Makaton Vocabulary Signs Taught, Understood and Produced

The first question that was examined relating to the mastery of Blissymbols and BSL (Makaton) Signing, concerned the total number of symbols or signs acquired by the children at each of the four six-monthly assessment periods. At each period the speech therapist or teacher who had primary responsibility for teaching the augmentative communication system, provided a list of all signs or symbols the child had been taught. This vocabulary list, which was unique for each child, was then used to test for acquisition of the signs/symbols at the expressive and receptive levels. The 20 Makaton users were tested only for sign comprehension and production, while the 20 Blissymbol users were tested only for Blissymbol comprehension and indication. <u>Comprehension</u> of each vocabulary item was assessed by presenting the child with an array of 4 pictures and asking him/her to indicate the picture corresponding to a given sign/symbol presented by the examiner. A standard set of pictures was used, which were chosen for their clarity and lack of ambiguity. Expressive knowledge of the vocabulary items was assessed by requiring the child to indicate the correct symbol or execute the correct sign in response to presentation by the examiner of a pictorial stimulus accompanied by a verbal label. All signs/symbols taught to the child were assessed for comprehension and expression, and the number of correct responses was expressed as a percentage of the total number of signs/symbols taught. In the case of assessment for comprehension, the percentage calculated incorporated a correction for guessing, to take account of possible chance selection of the correct picture out of the 4 alternatives presented.

As has been pointed out by Fawcett and Clibbens (1983), the assessment of sign production raises problems of experimenter effect and reliability of assessing the "correctness" of an elicited sign. In the present study, each sign produced by the child was judged to be either correct or incorrect. However, signs may obviously be produced with differing levels of accuracy, and for each sign a decision had to be made as to whether it was produced with sufficient accuracy to be comprehensible out of context. Fawcett and Clibbens (1983) found 90% agreement among 3 observers who rated 15 signs produced by 3 subjects as right or wrong on 4 criteria - the place, configuration, movement and orientation of the sign. In the present investigation, inter-rater agreement on sign production was assessed during the recording of the BSL (Makaton) communication samples and as such will be discussed in the following section. The question of reliability did not arise on assessment of symbol expression, since the child was merely required to indicate on his/her chart the symbol corresponding to its verbal and pictorial equivalent by hand or eye pointing.

Assessing the size of each child's sign/symbol repertoire, as described above, is clearly important. But this represents only one aspect of competence in sign/symbol system acquisition. Meaningful use of the signs and symbols in communicative contexts is the real goal of augmentative communication training. Assessment of this complex issue is described below.

19.3.3 Sign/Symbol and Speech Communication Samples - Recording and Analysis

There is evidence that children's performance in a test situation does not accurately mirror their spontaneous expressive language performance. Cazden (1967), for example, showed that children produced longer and more complex spoken utterances outside the testing situation than within it, while Prutting, Gallagher and Mulac (1975) found that 30% of linguistic structures used incorrectly in a formal testing situation were used correctly in spontaneous speech. It is thus clear that no one method will be adequate for establishing a child's level of competence, particularly when trying to assess something as complex as communicative ability. It is further relevant to point out that past research into the use of augmentative communication systems tended to focus almost exclusively on the assessment of children's sign and symbol vocabularies, thereby making no contribution to the question of augmentative system users' competence in communicative interactions. In view of these considerations, the present writer decided to supplement the formal tests of language expression and comprehension and sign/symbol vocabulary acquisition described above, with recordings of the children's expressive language performance in communicative settings. These recordings focused on the communicative use of Blissymbols/Makaton signs, as well as of speech. Unfortunately, there are no well developed language sampling procedures and analysis formats specifically geared to studying augmentative communication system use. The approach employed in the present study involves adaptations of recording and analysis techniques that were devised for spoken language samples, and focuses on the three interrelated aspects of content (meaning), form (syntax) and use (pragmatics) of language, in the hope that these will provide suitable measures of progress and effectiveness in augmentative system use.

19.3.3.1 Recording the Expressive Language Samples

As noted by Howlin (1979), there are two major problems involved in the selection of expressive language samples. The first concerns the situation in which the corpus of utterances should be gathered. It has been shown in a number of studies that the conditions under which a spontaneous language sample is obtained can radically affect the quantity and quality of the language produced. For example, Cole, Dore, Hall and Dowley (1978) found that children's talk while visiting a supermarket was more varied in terms of the conversational acts produced, and more complex grammatically, than their talk in the classroom; while Scott and Taylor (1978) found that language samples gathered in the clinic underestimated the frequency of complex utterances, questions, modals and volitional verb forms, and predisposed the child to talk about ongoing or imminent activities and the location of things. The amount of structure or constraint imposed on the child in recording is also important. Longhurst and Grubb (1974) and Bloom and Lahey (1978) found that children typically responded to pictorial stimuli by simply labelling objects, and that situations which the adult structured by asking questions likewise yielded restricted samples with few spontaneous exchanges. However, Turnure, Buium and Thurlow (1976) added that children would elaborate answers if certain interrogatives were used for prompting, with the most effective question forms being "why" and "how". In general, there is agreement for Longhurst and File's (1977) conclusion that less structured, conversational settings elicit language of greater quantity, complexity and variety than more structured, task-oriented settings. On the other hand, informal or conversational interviews do not yield comparability from one sample to another.

The second major problem involved in the selection of expressive language samples concerns the size of the corpus needed to obtain a representative sample of language ability (Howlin, 1979). Two approaches can be taken in determining sample size; the first is to specify the number of child utterances, and the second is to record for a specific period of time. As Howlin points out, there are no established criteria for determining the adequacy of sample size for linguistic analysis. The number of utterances used in previous speech analyses has varied from less than 100 (e.g. Lee, 1974) to over 1500 (Bloom, 1970). It has been suggested that unless one can acquire several hundred utterances, purely naturalistic samples might be unreliable. However, language impaired children do not produce nearly as many utterances as normal children. Obtaining samples of even 100 utterances would be unrealistic for many of the children included in the present study in view of their limited use of speech and (at least to start with) their limited knowledge of Blissymbols/ Makaton Signing, and also in view of the slow transmission rates of sign and symbol communication. It was consequently decided to use a time sample format of recording, and to adopt Miller's (1981) recommendation of using 30 minutes of interaction, since most children can perform without fatigue for this period of time. The time sample format has the added advantage of making frequency analysis meaningful.

In view of the 30-minute time limit imposed, and bearing in mind the the problems of comparability of informal recordings, it was decided that semi-standardized recording sessions would be preferable to settings with no controls. Each child was thus seen for two 30-minute semi-structured conversational sessions, the first to record the child's sign/symbol communicative exchanges (i.e. the child was encouraged to interact with the investigator using Blissymbols or BSL (Makaton) Signing), and the second to record the child's speech productions. It has already been pointed out that the type of stimulus material used to elicit language directly influences the type of language the child produces. Samples were therefore collected using a multi-task procedure, the amount of structure varying between tasks. Each recording session followed a loosely structured format, beginning with a 5- to 10-minute period spent in free conversation about topics of the child's choosing, for example activities engaged in at home or at school, and outings undertaken. This was followed by the introduction of a standardized set of toys (miniature dolls, furniture, car) with which the child was encouraged to play. Finally, the child was shown two picture books and encouraged to communicate about these. Some of the children were too physically handicapped to manipulate the toys themselves, and in these cases the investigator helped them to 'play' by manipulating the toys for them (often under their direction), and by turning over the pages of the picture books. Although a number of researchers have found the use of toys to be preferable to picture books in encouraging the production of more complex and varied speech (Miller, 1981), both types of stimuli were used here for two reasons: Firstly, because many of the children had very limited manual control and so could not manipulate the toys, and secondly because children whose hands are occupied in play are less likely to produce signs or indicate symbols on their charts. Pictures have the advantage of leaving the hands free to produce signs and symbols for communication. In general, however, no restrictions were placed on exactly what the child should be doing, in order to ensure as normal an interaction as possible. Their lead was followed, for example in giving them the opportunity to continue playing with the toys, or to communicate about unrelated topics.

The children were given unlimited time to produce as elaborate or lengthy utterances as they were able to and wished to, within each 30-minute recording session. Comments and questions from the investigator were introduced only when natural to the situation, and even then they were kept to a minimum. However, a number of the children produced very few or no spontaneous utterances. In these cases efforts were made to engage the child in conversation by asking a few standard, open-ended questions at regular intervals (e.g. "What's happening", "What happened", "Tell me more"). The use of such short and open-ended questions meant that the children would be unlikely to fail to comprehend the questions, or that these would substantially affect the form and content of the child's sampled language (Howlin, 1979). Throughout the recording sessions, the investigator communicated with each child in the modes typically employed in the child's classroom (i.e. using Bliss or Makaton Signing, and speech). Ambiguous utterances produced by the child were dealt with as follows: 1. The investigator paraphrased the child's sign/symbol utterance and checked whether the child was happy with the paraphrase. 2. Alternatively, the child was asked to repeat or elaborate upon his/her utterance. These techniques were particularly useful with the Blissymbol Users, who occasionally produced fairly complex utterances which were unclear, often because they were telegraphic and/or in incorrect (English) word order. In most cases these techniques were successful in clarifying meaning.

As already stated, two expressive language samples were obtained for each child in two separate 30-minute recording sessions. One was a sample of spoken language, and the second a sample of the sign/symbol utterances produced by the children. The two samples were gathered in <u>different</u> sessions because this enabled the investigator to encourage the child to make particular use of the signing/symbol mode in one session, and of speech in the second session. The speech samples were all tape recorded and subsequently transcribed onto paper for analysis. Each spoken utterance was considered a separate remark if it was marked off from preceding and succeeding utterances by pauses. Apparent terminal intonation contour also helped in segmenting the utterances. Only fully intelligible utterances were considered for analysis; utterances were excluded if any of their potentially scorable parts were unintelligible. Throughout the recording the investigator made notes on the context surrounding each utterance, including all linguistic and nonlinguistic antecedent events, as well as all child behaviours that occurred during, prior to and immediately following the utterance. Making such contextual notes while collecting expressive language samples has become standard practice, and is considered essential for interpreting children's utterances (e.g. Bloom, 1970; Brown, 1973; Miller, 1981). Although the sign/symbol utterances produced during the speech recording were <u>not</u> analysed, they too were noted down as part of the context in which the spoken utterances were produced.

In the second recording session, the Blissymbol or BSL (Makaton) utterances produced by the child were recorded, again with all relevant contextual information. Unfortunately, it was not possible to videotape these sessions, because of the practical difficulties involved in transporting recording equipment from school to school. The signs/symbols produced by the child were therefore transcribed in long hand, using English glosses for each sign or symbol. This approach clearly has drawbacks in that the quantity of data that can be recorded at one time is limited by memory and speed of writing, and by the fact that one cannot easily observe and write at the same time. In practice, however, this task did not prove too difficult, since the children tended to produce very few sign or symbol utterances during the recording sessions. Following convention, the English glosses were written down in capital letters. When transcribing the Blissymbol utterances, the English word printed below each symbol on the Bliss chart served as its gloss. The Makaton Vocabulary signs, too, have been assigned fairly direct English word translations (Walker, 1976), and teachers typically teach the signs as equivalents of these English words. Transcription of the signs therefore involved writing down the English equivalent of each sign produced. It must be borne in mind, however, that there is not always a one-to-one relation between an English word and the meaning of the sign/symbol it represents. Where more than one English word was required to gloss a sign or symbol, the written words were connected by hyphens (e.g. the sign for RIDE-A-BICYCLE). Another problem particularly relevant to the sign recordings concerned the transcription of signs which represent objects that are closely associated with observable actions or movement. Such signs can have either a verb or a noun meaning (e.g. FOOD/EAT; CAR/DRIVE). In such cases the meaning of the sign, and therefore the form of the English gloss used (i.e. whether noun or verb), was determined from the context. If it was not clear whether the child was referring to the object or the action, the sign in question was deemed to be uninterpretable. The problem of transcribing fingerspelled items did not arise, since none of the signing children used fingerspelling. All spoken utterances produced during the sign/symbol recordings were noted as part of the context in which utterances were produced, but were not transcribed for analysis. Each sign/symbol utterance was defined as a unit of language marked off on either side by a pause. In the case of the Blissymbol productions, which have a particularly slow transmission rate, the investigator also adopted the procedure of checking whether the child had completed a given utterance, by asking "Are you finished or are you going to show me another symbol?"

There are several other aspects of augmentative communication use which can present real difficulties when one attempts transcription and analysis. In sign language, unlike spoken language, there is a spatial as well as a temporal dimension, and signs can be produced simultaneously as well as sequentially (Deuchar, 1984). However, it has been found that when signs are taught as English word equivalents, and following English syntax, the simultaneous production of signs does not occur. The BSL (Makaton) Signers included in the present study, too, produced signs only sequentially, so that the problem of the transcription of simultaneously produced signs did not arise. On the other hand, the question of what to consider as signs was problematic. Recently, researchers have begun to pay attention to the role of non-manual activity in signing, both at the level of individual signs and at the level of sign language grammer (e.g. Deuchar, 1984; Kyle and Woll, 1983). Aspects of non-manual activity that appear to form part of the linguistic message in ASL and BSL include body movements and facial expressions, for example the shaking of the head while simultaneously signing an affirmative utterance to indicate negation, and the movement of the eyebrows or eyes to mark questions. Such non-manual components are not paralanguage, but part of a multi-channel system in which all channels contribute to the syntax and meaning of the signed utterance (Bonvillian, Charrow and Nelson, 1973). Other grammatical mechanisms used include modification of the location of a sign and of direction of movement, for example in order to incorporate persons, manner or location in the movement of the verb. The use of English glosses, as in the present study, is clearly inadequate to render the intrinsic character of such multi-channel signs, and omits much information having to do with body shifts, eye movements, use of space, directionality and facial gesture. Nevertheless, the present writer decided to focus only on the manual aspects of the signs produced by the BSL (Makaton) Users, because it was not possible to videotape the recording sessions, and also because there is no established methodology or notation system for the representation of these non-manual aspects of signs. On a more positive note, it is likely, at least for the present subjects, that the non-manual aspects of signs were less important than they are for deaf signers. Newport and Ashbrook (1977) found that young children seem not to make use of the incorporative syntactic devices which are used by native deaf signers. Rather, in the earliest stages of signing, they tend to express relations by producing a separate sign for each argument. In addition, and as already noted, BSL (Makaton) signs are trained as equivalents of spoken words, so the use of multi-channel signs is not likely to be taught or modeled by teachers.

Much more significant is the fact that sign and symbol utterances are typically interspersed with elements of pantomime and gesture which convey much communicative intent. Again, the lack of an adequate methodology to transcribe, interpret and analyze such communicative behaviours, and the fact that it was not possible to videotape sessions, led to a decision to transcribe only specified Makaton signs and Blissymbols. Pantomime and gestures were thus not transcribed for analysis, although they were noted down as part of the context in which signs and symbols were produced, and thus served as an aid to clarifying semantic and pragmatic intent. It is, however, recognized that a full picture of a child's communicative competencies cannot be drawn without recording and analyzing such nonverbal behaviours.

The recording of sign productions raises the important question of reliability. To establish inter-judge agreement on the BSL (Makaton) utterances produced by the children, independent transcripts (in English gloss form) were made by the investigator and a speech therapist during half-hour recording sessions with 10 Sign Users. For an agreement to be scored, each of the two judges had to record a given sign (i.e. its English gloss) as present. Signs recorded by one judge but not the other, or signs given different glosses by each of the judges, were considered disagreements. Inter-judge agreement (agreements/agreements + disagreements) was computed on a subject-by-subject basis and ranged from 71.43% to 96.30%, averaging 86.59% across subjects. Bearing in mind the poor manual control of many of the children, these reliability figures are considered highly satisfactory.

The question of reliability in recording the Blissymbol utterances did not arise, since these utterances were produced by pointing to individual symbols on the Bliss charts - a task which is not open to recording bias.

19.3.3.2 Analyzing the Expressive Language Samples

Following the collection of the expressive language samples, the next step was to develop analysis formats which would cover the major areas of early language development and would be appropriate for measuring progress and effectiveness in the use of spoken language, and also in augmentative system use (i.e.in the Blissymbol and BSL (Makaton) language samples). Since there is no accepted framework for analyzing expressive language samples produced in sign or symbol form, and since augmentative communication systems are, in any event, typically taught within a simultaneous communication framework, it was decided to turn to the psycholinguistic literature and to explore the relevance of using analysis formats devised for speech communication. The major developments that have taken place in this field over the last two decades will be briefly reviewed, since they provide the background against which the analysis formats in question were selected for use.

The first phase of the modern study of language, beginning with the work of Chomsky in the late 1950s, emphasized syntactic development as the key to language acquisition. Research over the next decade and a half focused almost exclusively on the structure of language, and the main theoretical controversies concerned claims as to the proper description and representation of that structure. Chomsky (1957) argued for a transformational generative grammar, in which a sentence receives two representations - a surface structure and an underlying or deep structure. The surface structure represents the structural and physical characteristics of the sentence as it is spoken. The underlying structure is an abstract representation of the essential syntactic characteristics of the sentence and is never realized directly in speech. Transformational rules are seen as operating on the underlying structures of sentences to produce surface structures through the application of sequences of ordered rules. Chomsky (1965) further suggested that the normal child most probably has an innate predisposition toward acquiring syntax. As Kiernan (1982) has pointed out, one consequence of this approach was that handicapped children could be helped only by a structured programme which would enable them to develop whatever inborn language structure they might possess.

Despite the enormous influence of Chomsky's work on psycholinguistic research, transformational grammars proved inadequate to deal with the emerging, non-grammatical speech of young children. Transformational grammars have been written only for the correct utterances of adult speakers; they are not always capable of distinguishing between grammatical and non-grammatical utterances, and attempts to apply the grammars to the quite different one- and two-word utterances of young children proved problematic (Howlin, 1979). Other approaches, which focused more closely on descriptions of <u>early</u> language development and the beginnings of syntax, were equally unsatisfactory. Braine (1963) described the beginnings of syntax in terms of a few simple productive rules. He proposed that the child initially learns two grammatical classes of words - a relatively small class of 'pivot' words, which are used only in the initial position in utterances, and a larger class of 'open' words, which can appear either in the initial position or later in the utterance and can be conjoined with another 'open' word or follow a 'pivot' word. However, the definition of 'pivots' as fixed in position, never occurring in isolation, and never occurring in combination with other 'pivots', did not hold up in the case of all children studied (e.g. Bloom, 1970; Brown, 1973). In addition to the collapse of empirical distributional support, 'pivot' grammars suffered a second attack on theoretical grounds. It was pointed out that they could not explain the transition from the two-word utterance stage to the adult model; and they described children's utterances only in the most superficial way, thereby greatly underestimating the child's linguistic knowledge. Bloom showed how the same surface structure can occur in different situations with very different interpretations or functions. In her classic example, the utterance "Mummy sock" was used by one of her subjects in two different contexts, with apparently different semantic relationships between the constituents (on one occasion to express a subject-object relationship, and on another occasion to express possession). These two occurrences of the utterance would have the same structural description if classed in terms of 'pivot' grammar, because the surface form of each is the same. It would thus appear to be necessary for descriptions of child language to do more than describe the surface constituents of utterances that can occur.

By the late 1960's and early 1970's several researchers had become frustrated with the limitations of a purely syntactic theory of language development, and began to look towards a semantically based approach. This marked the beginning of the second phase of the modern study of language development (Kiernan, 1984). Bloom (1970) and other workers argued that language learning is in the first instance a question of the child's learning to express meaning, and that within this context syntax is learned as a secondary phenomenon which helps with the realization of these meanings. The pioneers in the field of semantic analysis, Bloom (1970), Bowerman (1976), Brown (1973) and Schlesinger (1971), all subscribe to what is described as the method of rich interpretation, in that they attempt to go beyond the surface of the child's utterance and with the aid of contextual information, attribute a semantic interpretation to it. Significantly, they all arrived, to some extent independently, at remarkably similar conclusions about the types of meanings expressed in children's earliest utterances. Young children were found to talk about such things as the existence and nonexistence of objects, actions performed on objects, and the locations of objects. Brown (1973) surveyed all the most fully reported studies on early child speech, which included languages such as French, Samoan, Luo, Finnish and English. He found strong evidence that children learning these distinct languages all expressed the same narrow range of meanings, and he claimed that a small set of 8 semantic relations accounted for the majority of the children's utterances at the earliest stage. The major meanings determined in this way were agent and action, action and object, agent and object, action and locative, entity and locative, possessor and possession, entity and attributive, and demonstrative and entity. Brown consequently argued for the universality of these semantic relations in early language development and, in the case of English, pointed to the child's use of correct adult word order to signal contrastive meanings as justification for such a "rich interpretation" of the child's speech.

The semantic approach has proved fruitful in several ways. In the first place, as already noted, it has led to the identification of basic similarities in the development of children from diverse language backgrounds. Secondly, it has provided a much needed route for linking children's linguistic development with their general cognitive growth. Brown, Bowerman and others have suggested that similarities in the acquisition of meaning result from the way in which the underlying cognitive structures provide children with the necessary knowledge to organize their experiences with people, objects and events. With reference to Piaget's (1964) work, they argued that the particular semantic relations that are prevalent in early speech are cognitive distinctions that the preverbal child has mastered in the period of sensorimotor development.

There are, of course, considerable difficulties in the analysis of semantic content, the major one being the question of how best to classify utterances semantically. As Bowerman (1976) points out, we do not know which classification scheme is "right", in the sense that it classifies according to semantic distinctions which are functional in the child's own system of rules for combining words. Although the sets of relational meanings that different investigators have selected for describing and classifying children's utterances are very similar, they are not identical. For example, Bloom (1970) subdivided negative constructions into three semantic categories, whereas Schlesinger (1971) proposed only one category for all negative constructions. It must be remembered that this work documents accounts of how adults interpret children's utterances. It is still an empirical question whether these semantic categories actually correspond to aspects of the structural knowledge which enables children to produce and comprehend utterances. Although the semantic approach depends heavily on interpretation by the adult of utterances and the contexts in which they are produced, there are, at the two-word stage, two types of evidence for semantic relations. These are, firstly, the use of the dominant word order to encode a semantic relation (i.e. if the child consistently chooses one order, one can be more certain that he is not simply successively naming aspects of the situation); and, secondly, the fact that the two words typically have a single prosodic contour without a pause, suggesting they are conjoined to express a relation (Brown, 1973; De Villiers and De Villiers, 1978).

The growing interest in the 1970's in the meanings of words and utterances led to the realization that sentences derive their meanings from the contexts in which they occur. Children do not describe events in a social vacuum. Instead they use language for a variety of social purposes, and the same utterance can function very differently for speakers, depending on who uses the utterance and in what kind of social and conversational context. This contextual influence is the study of language from the perspective of pragmatics and it has come to be the most recent movement in linguistics and psychology (Bates, 1976; Bruner, 1975). From this perspective, researchers look at children's performance in conversations rather than utterance by utterance, and they look at the functions language serves in social interactions (Lund and Duchan, 1983).

Such an approach to language development in terms of communication, including all methods of interacting, rather than just in terms of speech and language, highlights the continuity with prelinguistic social development (Bruner, 1975). As Kiernan (1982) points out, studies on mother-infant interaction show that children are able to communicate well before they use speech. They learn how to regulate the activities of others in the service of their needs, how to maintain adult attention, and so on (Bruner, 1975). Many of these messages are expressed non-verbally through gestures and stress and intonation patterns in the child's sounds, these patterns being transferred to speech as it emerges. The conclusion emerging from this work is that the mainspring of language development is the child's need to communicate, and the child's acquisition of syntax and linguistic rules probably reflects his growing desire to be able to communicate more and more complex meanings to others (Bates and MacWhinney, 1979).

Since the term 'pragmatic' implies the social use of language in context, examination of pragmatic behaviours needs to acknowledge that communication is a two-directional process between speaker and listener, and detailed information needs to be obtained of the sampling situation. The areas in which pragmatic assessment can be undertaken include the assumptions which people make when they communicate, the intentions underlying what they say, the way context influences the amount they say and the way they say it, turn-taking, the appropriateness of the subject matter to the situation, and more (Fuller and Southgate, 1984). The area is wide open to different approaches, and it is not possible to present a single classification of pragmatic variables. Utterance intentions provide one index of the use of language for communication and as such will be examined in the present study. For children with speech and language skills, intention is most frequently defined in terms of 'speech acts' or 'conversational acts'. Several schemes for classifying speech acts have been developed for children at the single word stage of development (e.g Dore, 1974, 1975; Halliday, 1975), and Dore (1978) has developed a further, elaborate scheme for coding conversational acts in pre-schoolers' speech. Just as any number of semantic classifications can be imposed on a given utterance, so investigators are free to impose the functional categories they see as important, and to slice these as broadly or as finely as they choose (De Villiers and De Villiers, 1978). It is reassuring that the various researchers have converged on a similar broad categorization of function. However, there are still very few studies which assess the acquisition and use of such functions in normal children, and even fewer in language handicapped children.

With each shift of research interest, claims have been made of the inadequacy of studying those areas that were formerly of interest. However, what is clear from the above review is that the three major approaches to language development that have been outlined are in most ways complementary; 'disagreements' rest primarily in terms of emphasis (Kiernan, 1984). Bloom and Lahey (1978) describe language as consisting of some aspect of content or meaning that is coded or represented by linguistic form for some purpose or use in a particular context. Normal language learning thus develops through the interaction of content, form and use, and an understanding of all these subsystems is necessary for understanding language acquisition. As such, the sign/symbol and speech samples gathered in the present study were each analyzed in terms of selected aspects of these three subsystems of language - that is, by considering the form used to code information, what the child means to say, and the purpose for which he/she communicates. The analysis formats adopted, which will be fully described below, thus allowed for examination of changes in the use of normal syntactical rules and appropriate, functional communication in Blissymbols/Makaton Signing and also in spoken language.

Augmentative communication systems are capable of expressing semantic and pragmatic content, and analyses from these perspectives are thoroughly appropriate. Indeed, the few studies that have reported semantic and pragmatic analysis of children's sign or symbol productions thus far (e.g. Bonvillian and Nelson, 1976; Harris, 1982) provide support for the value of these approaches in shedding light on the early stages of augmentative communication use. On the other hand, it has already been pointed out that augmentative communication systems differ from spoken language in the grammatical devices used to express meaning. However, when using Blissymbolics and signing with the language impaired, teachers and speech therapists typically adopt a simultaneous communication approach; they use signs and symbols in conjunction with speech and in spoken English word order; and signs and symbols are trained as equivalent to spoken English words. Determining the extent to which the children adhere to the use of spoken English structures in their sign and symbol expressive outputs was therefore felt to be a valid question, and this issue was examined through the syntactic analyses described below. A final point to note is that augmentative system users typically communicate using a combination of modes - symbols/signs, gestures, pointing, facial expressions, vocalizations and/or speech (Harris, 1982). In the present study analysis was confined to the sign/symbol and speech utterances produced. Although gestures, facial expressions etc. were noted as part of the context, and therefore contributed to the semantic and pragmatic analyses, the present investigator was, unfortunately, unable to consider their communicative role directly.

A. Syntactic Analysis of the Sign/Symbol and Speech Samples:

1. General Indices of Syntactic Development:

Measures of average utterance length have been used for many years as a quantification of children's productive language status (e.g. McCarthy, 1954). More recently, Brown (1973) developed a concept of mean length of utterance based on the number of morphemes per utterance (MLU-M). He argued that the MLU-M is a more sensitive index of grammatical development in pre-school children because almost every new kind of knowledge increases length: the number of semantic roles expressed in a sentence, the addition of obligatory morphemes, coding modulations of meaning etc. Brown found that at comparable MLU-M values, his subjects were using similar grammatical structures in their speech up to MLU-Ms of about 4.00. At this point, children are able to make constructions of such great variety that what they happen to say and the MLU-M of a sample begin to depend more on the character of the interaction than on what the child knows, so the index loses its value as an indicator of grammatical knowledge.

The validity of this measure has been the subject of much critical discussion. A number of researchers have pointed out that indices of length are likely to be affected by a host of variables, including familiarity with and interest in the topic or stimulus, the familiarity, age, linguistic skill and conversational role of the addressee, the context in which sampling occurs, and demographic and cultural variables of the subjects (e.g. Shriner, 1969). However, both Brown (1973) and De Villiers and De Villiers (1973) found MLU in morphemes to be a good predictor of syntactic development for children under 5. Udwin and Yule (1982b) and Wells (1979), too, found high correlations between measures of MLU-M and of syntactic and semantic development (including the Reynell Language Scales and LARSP (Crystal, Fletcher and Garman, 1976)) in normal preschool children. Because of its global nature and the ease with which it can be calculated, the MLU-M therefore probably remains the most satisfactory, although crude, general indicator of stage of development, at least in the first few years (Wells, 1979). High inter-tester and temporal reliability coefficients have also been reported for MLU-Ms of up to 4.00 (Layton and Stick, 1979; MacDonald, 1978).

In view of the above, MLU was used as a general index of syntactic development in the present study. For the speech samples, mean length of utterance was computed in morphemes, according to the rules laid down by Brown (1973). The procedure used is described in detail in Appendix 7. In the case of the Blissymbol and Makaton Sign samples, however, the mean number of signs/symbols per utterance (MSLU) was obtained, and not mean <u>morpheme</u> length of utterance, because of the need to accommodate syntactic variations between BSL (Makaton) and Bliss, and the English language. Blissymbolics and BSL (Makaton) do not, for the most part, allow for morphological markers in the signs/symbols <u>themselves</u>, thereby making a morpheme count, as is typically done in English, unfeasible. Essentially each complete signed movement or each symbol indicated counted as one point. In instances where one sign/symbol accounted for two or more English words (e.g. the sign for SIT - DOWN), only one sign/symbol was counted for MLSU purposes. Repetition of a single sign or symbol was not counted in the computation, unless such repetition was very clearly used for emphasis or to indicate plurality.

As calculated averages, MLU-M and MSLU ignore the important distributional characteristics of expressive language samples. Variation around the mean is to be expected. For example, a child with a mean utterance length of 2.00 should produce a number of single words/signs/symbols, as well as some two-, three- and four-term utterances. But as Miller and Chapman (1981) point out, a number of spuriously long or short utterances may render the MLU unrepresentative, while samples with utterances of all the same length may indicate a limitation in productive span. MLU-M and MSLU calculations were therefore accompanied by a distributional analysis of utterance lengths, i.e. by quantifying the number of utterances produced at each length. In addition to these indices, the total number of utterances produced in each sample was noted. All utterances were further classified as Spontaneous (utterances which are 'child initiated', and not an apparent response to an immediately preceeding verbalization by the adult) or Response utterances (utterances which are a response to questions, commands or statements produced by the adult).

The measures described above have been shown to be closely correlated with general language development, but they are only gross indices and in themselves offer no real information on the nature of the linguistic and grammatical development taking place. There can, for example, be important differences in relative grammatical competence among children with the same MLU (Cazden, 1968). The notion of length therefore needs to be supplemented by additional information on syntactic complexity.

2. Language Assessment, Remediation, and Screening Procedure (LARSP):

There are very few comprehensive formal procedures available for analyzing expressive language samples syntactically. Lee's (1974) Developmental Sentence Scoring procedure, for example, gives weighted scores to a developmental order of 8 grammatical structures; but the selection of structures is unrepresentative of the syntactic system as a whole, and certain categories receive disproportionate weighting. Crystal, Fletcher and Garman's (1976) LARSP procedure is one of the most comprehensive grammatical assessment procedures available. As such it was used in the present study in order to examine the grammatical structures produced in the children's sign, symbol and speech samples, and the extent to which these are consistent with the structures used by normal English speakers. LARSP has the added advantage of being sufficiently differentiated at the earliest stages to provide a meaningful analysis of even very restricted expressive language samples. Crystal et al.avoid the notion of a syntactic score, and use instead a syntactic profile in which a wide range of syntactic structures are presented. The frequency of occurrence for each structure is recorded, and a qualitative assessment can be made of areas of strength and weakness. Crystal et al. identified 7 stages of syntactic development corresponding to chronological age (ranging from 9 months to 4.06 years and over), and they described the syntactic characteristics of each stage. Assignment of particular features to the various stages was based on the literature in developmental psycholinguistics. Each stage thus contains the structures which operate over a particular period of development. The stages are not viewed as discrete entities, but rather as arbitrary divisions along a sequence of normal development. Although the stages are given chronological age limits, many of the structures which emerge during a particular stage will continue to be used thereafter.

Each language sample is examined in terms of a multilevel scanning procedure. The sample is scanned first to determine which utterances cannot be analyzed. Utterances which are excluded from further analysis include utterances which are unintelligible, deviant utterances which fall out of the normal expectations of language use, ambiguous utterances whose meanings even with context are not clear,and stereotypes (phrases which have been picked up and reproduced and which should not be analyzed further). It must be pointed out here that in view of the probability of a high percentage of deviant word orders appearing in the sign and symbol utterances (as found by Fenn and Rowe, 1975), the present writer decided to disregard order when marking structures, provided that the utterances were not ambiguous. The question of correct order is examined separately below. Analyzable utterances are then classed as 'major' or 'minor' utterances. Minor utterances do not postulate any syntactic structure; they include greetings and other social phrases (e.g. 'hi', 'yes', 'sorry') and are not analyzed further. Each 'major' utterance, on the other hand, is analyzed at 1 of the 7 linguistic stages in terms of clause, phrase and/or word categories, depending on the complexity of the utterance. Additionally, the main function of the utterance is analyzed as a statement, question, command or exclamation.

The LARSP procedure is fully described by Crystal, Fletcher and Garman (1976; Crystal, 1979, 1982) and a summary LARSP assessment chart is presented in Appendix 8. The 7 developmental stages comprising the chart will be only briefly described here.

At Stage I utterances are restricted to single words, and these are categorized as question words (e.g. 'what', 'why'), commands (verbs used as imperatives), nouns, verbs, or 'other' words (e.g. adjectives). Stage II ranges from about 1½ to 2 years of age and is a stage at which utterances characteristically contain 2 elements of structure. Among the 2-element constructions categorized here are subject-object, verb-object, negative + another element, and question word + another element, all at the clause level; and determiner - noun, noun - noun, and verb - particle, at the phrase level. Stage III ranges from about 2 to 2½ years of age. It is a stage at which utterances characteristically contain 3 elements, but also subsumes certain developments at phrase level which are unrelated to the matter of clause complexity, for example pronouns and use of the copula. Other phrase structures to be marked include determiner-adjective-noun; and preposition-determiner-noun. Clause element structures to be found include subject-verb-object, subject-verb-adverbial, and a question word with 2 other elements.

Stage IV runs from about 2½ to 3 years of age and is a stage at which clauses characteristically contain 4 or more elements. Among the clause element structures to be found are subject-verb-object-adverbial, a clause containing 2 adverbials along with 2 other elements of clause structure, and a question word with subject-verb inversion. At phrase level there is a comparable growth in complexity as well as the development of new types of phrasal construction. Structures noted include preposition-determiner-adjective-noun, and 2 phrasal constructions linked by a coordinating conjunction (usually 'and'). Stage V runs from about 3 to 3½ years of age. The primary characteristic of this stage is the development of complex sentence formation, through the stringing together of clauses and the embedding of one clause within another. The use of coordinating and subordinating conjunctions is noted, as well as instances of 2 or more clauses being linked by these conjunctions. Use of comparative clauses, and postmodifying clauses and phrases, is also noted.

Stage VI runs from about 3½ to 4½ years. Here several new structures are marked (e.g. passives), as well as errors made by the child in the use of structures noted in earlier stages, including errors in word order, omission of determiners etc. Stage VII is concerned with some general aspects of discourse and stylistic features that emerge after the age of 5 years. The Stage VI analysis of errors was considered to be pointless in the present study because deviations in word order were likely to be numerous, and because such structures as determiners, the copula, auxiliaries and inflections are not taught in the Makaton Vocabulary and (for most children) are unlikely to be available on Blissymbol charts. They would strictly speaking have to be noted as omissions in an analysis of errors. Furthermore, the features emerging in Stages VI and VII were not likely to be found in the children's expressive language samples. The stages were therefore omitted from the analysis.

The ability of the child to introduce phrases into clause structure is plotted separately on the LARSP profile. The profile plots phrasal expansions which take place in 2- and 3-element clauses. For example, the category X + S : NP refers to a 2-element clause which has its subject expanded by a noun phrase. Word-endings with a grammatical function are also marked separately in LARSP, and include the present progressive '-ing', the plural form, the past tense form, and the contracted negative form. The marking of these inflections was undertaken only for the speech samples, as most morphemes are not provided for in Blissymbolics and BSL (Makaton) or are provided for in a different way (e.g. by having a separate Blissymbol to indicate the plural or the past tense form of a verb).

LARSP provides raw data and guidelines for determining an overall stage of functioning, but it lacks an explicit convention for summarizing and interpreting the data by means of an overall stage assignment. In the present study, the frequency of occurrence of <u>each</u> of the structures listed in the LARSP profile chart was scored, and, in addition, a number of summary measures were derived. These include the total number of clause and phrase structures scored at each of the 5 stages; the proportion of clause to phrase structures used at Stages II, III and IV; the proportion of adjacent stage clause structures; the ratio of Stage I items to the number of clauses and phrases of Stages II to V; and the proportion of clauses at Stages II and III containing an expanded phrase structure (i.e. a measure of the integration of phrase structure into clause structure).

One difficulty with the sign samples is that BSL (Makaton) makes no syntactic distinction between various syntactic forms of some signs, which are represented by a single sign. For example EAT and FOOD are represented by the same sign, as are BED and SLEEP. In such cases nouns and verbs were identified on the basis of functional criteria for the purposes of the LARSP analysis. Where it was still unclear whether a given sign referred to a noun or verb structure, the utterance was placed in the 'ambiguous' category.

No standardization data are as yet available on LARSP, and there is only one published report on inter-rater reliability for the procedure. Bamford and Bench (in Crystal, 1979) found reliability coefficients for 2 raters of between 0.89 and 0.96, indicating that LARSP can be reliably coded despite the large number of categories involved. Inter-rater agreement was computed in the present study for coding speech, sign and symbol protocols, and will be fully reported below. The question of validity, too, has not been examined, with the exception of a report by Klee and Rhea (1981) comparing the results of 6 standard structural analysis procedures which were applied to one 30-minute speech sample. The 6 procedures used were MLU, the Assigning Structural Stage procedure (ASS) (Miller, 1981), the 14 grammatical morphemes studied by Brown (1973), Lee's (1974) Developmental Sentence Scoring procedure, Tyack and Gottsleben's (1974) Language Sampling, Analysis and Training procedure (LSAT) and the LARSP procedure. Klee and Rhea found that both MLU and the ASS procedure placed the child's productive language system within normal bounds, while the DSS and LARSP placed the child's language significantly below the range of normal variability. However, as each of these procedures has its own particular inadequacies (MLU and ASS are much less detailed than the other procedures, while LARSP lacks standardization data), such comparisons between procedures are not at present particularly helpful. Large-scale longitudinal and cross-sectional studies to validate stage placements and age-equivalents are needed to resolve such discrepancies.

3. Word Order:

The present writer also considered it important to ascertain how closely the children reflected conventional English word ordering in their sign and symbol productions. The question of correct word order is important because, according to Brown (1973), it is the major syntactic mechanism controlled in the early stages of language development. Moreover, many teachers and speech therapists have informally noted the difficulties in teaching language handicapped children to produce sign and symbol utterances in correct English word order (see also Fenn and Rowe, 1975). In this regard it must again be stressed that although Blissymbolics and BSL have their own recommended word orderings, which differ from English syntax to a greater or lesser extent, the systems are typically taught and used by teachers together with speech and following English word order.

The data examined was restricted to those sign/symbol utterances and spoken utterances using some combination of subject (S), verb (V) and object (O), or using a determiner (D), adjective (Adj) and/or preposition (P) together with a noun (N), under conditions that permitted either standard or optional ordering. Question and command forms and copulative utterances were excluded. A sample count was undertaken of the incidence of all the following word order patterns (the conventional English pattern is underlined):

1. SV / VS	2. VO / OV	3. SO / OS	4. SVO SOV VSO / OVS OSV VOS	5. DN / ND
6. Adj N / N Adj	7. Pr N / N Pr	8. D Adj N / Alternative orders	9. Pr DN / Alternative orders	

For each category, the percentage of utterances demonstrating the conventional English word order was then calculated. It should be noted that the subject and object roles were assigned on the basis of the way that utterances were used in context. Naturally, these decisions represent an interpretation from the adult point of view.

B. Semantic Analysis of the Sign/Symbol and Speech Samples:

There are several approaches to describing the semantic relations children express in their multi-word combinations, although thus far these have been limited almost entirely to the two- and three-word utterance stages of language development. As already discussed, Bloom (1970), Brown (1973) and Schlesinger (1971) have each offered their own variation of the basic set of prevalent meaningful relations existent at these stages. Significantly, all agree on the same general notions that normally developing children choose to talk about. MacDonald's

(1978) Environmental Language Inventory (ELI) is based on the work of Schlesinger and Brown, and is designed to evaluate multi-word utterances according to the basic semantic relations proposed by these writers. This model is most suitable for use with individuals whose expressive language is largely limited to two- and three-word utterances. As such it was considered to be appropriate for examining the meanings expressed in the language samples produced by the children included in the present study.

All two-word/sign/symbol utterances were classified according to the 8 prevalent semantic relations which have been found by Brown (1973) to account for over 70% of children's early word combinations. These are 1. Agent-action 2. Action-object 3. Agent-object 4. Agent/object-location 5. Action-location 6. Negation-X 7. Modifier-head 8. Introducer-X. The ELI presents definitions and criteria for classifying utterances according to these categories (MacDonald, 1978), and these are described in Appendix 9. Turning to three-word utterances, Brown (1973) proposed that these are either combinations of two previously used two-word utterances (e.g. agent-action and action-object = agent-action-object), or expansions of two-word utterances (e.g. action-location becomes action-modifier-location). MacDonald and his colleagues identified 19 relational concepts which occurred 5 times or more in samples of three-word utterances collected from a group of 28 normal children aged 13 to 57 months. They found that 5 of these three-word semantic functions accounted for over 75% of the total utterances produced. These 5 semantic relations, which may be considered as the primary three-word semantic relations expressed, were 1. Agent-action-object 2. Experiencer-state-source 3. Introducer-modifier-object 4. Agent-action-location 5. Action-modifier-head. The present subjects' three-word, sign and symbol productions were accordingly classified in terms of these 5 categories. In the case of four-term and longer utterances, the list of possible semantic relations expressed becomes larger still. Only one category was specified here, namely agent-action-object-location. Obviously these relations do not account for <u>all</u> multi-term combinations. Therefore, in each of the two-, three- and four-term schemes, an 'other' category was included, to cover additional semantic relations not included in the specified lists. An 'unclassifiable' category was also included, for utterances that are semantically uninterpretable. For some of these one cannot offer any reasonable hypothesis whatsoever; for others one can offer two or more semantic relations, but there is nothing that enables one to choose among them.

The semantic relations used for classification are listed and defined in Appendix 9. All multi-sign/symbol and word utterances produced by the children were classified according to this scheme,thereby enabling the writer to determine the frequency of use of each semantic relation, and the percentage of utterances which fitted these categories. In all cases the interpretation of the semantic intention of utterances was based not only on the utterances themselves, but also on information relating to extralinguistic data and behaviour in the larger context in which the utterances occurred.

It must be noted at this point that such attempts to categorize the semantic relations reflected in multi-term utterances have met with some criticisms. Howe (1976) points out that investigators have not all agreed on the exact categories to be used in classifying meaning. Also, the technique of taking account of the accompanying nonlinguistic context in classifying semantic notions, while having clear value, relies on certain assumptions that may not be valid; for example, it relies on the assumption that the child is consistently attempting to communicate the nonlinguistic relationship as he sees it. No provision seems to be made for the possibility of prevarication or fantasizing. Howe further stresses the possibility that many of semantic relations ascribed to the child may actually be operative only for the adult linguistic system, and that we may be attributing to the child more knowledge than he/she actually possesses. In addition, little work has as yet been done in applying these semantic categories to clinical populations. On the other hand, there is considerable agreement between writers as to the prevalent semantic relations expressed in early utterances, and the few research studies that have been conducted appear to confirm the applicability of these relations to expressive language samples produced by normal and language impaired speakers. Retherford, Schwartz and Chapman (1981), Coggins (1979), Leonard, Bolders and Miller (1976) and Freedman and Carpenter (1976) found that groups of normal, language disordered and Down's Syndrome children matched for MLU all concentrated on the same small set of semantic relations enumerated by Bloom, Brown and Schlesinger; and these were found to account for the majority of their early word combinations. Furthermore, Newport and Ashbrook (1977) showed that young children learning ASL from their deaf parents sign the same prevalent semantic relations that their speaking counterparts talk about. The few semantic analyses conducted to date on the language productions of augmentative sign users (including nonverbal autistic and cerebral palsied children) show that they too use some, if not all, of the semantic relations characteristic of Brown's first stage of normal speech development

(Bonvillian and Nelson, 1976; Fenn and Rowe, 1975; Layton and Baker, (1981). It thus seems that a semantic analysis can be applied to production modes other than speech.

Coggins (1979), Freedman and Carpenter (1976) and MacDonald (1978) have all found high inter-judge agreement on the semantic classification of utterances; in all cases agreement was above the 90% level. Coggins further found within-judge agreement of 88% after 4 months. The present writer examined the extent of inter-judge agreement on classifying sign, symbol and speech utterances semantically, and these results are discussed in detail below.

A final point to note is that, in the present study, semantic analysis was applied only to the multi-term utterances that were produced. Several authors have sought to extend the method of rich interpretation back into the one-word period, and challenge the assumption that the use of semantic relations develops only when two-term combinations appear (e.g. Greenfield and Smith, 1976; Rodgon, 1976). They argue that even a single word can express a semantic relation since contextual features can be considered part of the linguistic structure. The child is structuring the environment into categories such as agent and object, and into this conceptual framework he/she inserts single words. However, Schlesinger (1974) has argued strongly for distinguishing knowledge of the world from knowledge of the language. The present writer agrees with Coggins (1979) and others who point out that at present there is insufficient justification for assuming that the meaning and function of single words reflects the same degree of semantic specificity revealed in two-term utterances. Multi-term utterances have additional evidence, over and above context, in support of semantic relations, namely the use of the dominant word order to encode such relations. Single-term utterances lack such structural cues and were therefore excluded from semantic analysis in the present study.

C. Pragmatic Analysis of the Sign/Symbol and Speech Samples:

The focus in the present study is on the area of pragmatics devoted to the analysis of communicative intents - the reasons why individuals communicate. As pointed out by Chapman (1981), there are multiple perspectives from which communicative intents may be judged. One reason for the diversity lies in the different developmental levels of children studied; a second lies in the differing degrees to which discourse and social context are considered. Communicative intents can be identified at any of four levels of analysis, namely utterance, interactive, discourse and social levels. The emphasis here is on classifying intent at the utterance level, although it must be noted that in practice many of the existing taxonomies include categories from different levels of analysis, and the opportunity for multiple coding of an utterance from each level's perspective is not always made apparent (Chapman, 1981).

Early communicative intents expressed by children under 2 years of age have been studied intensively by Bates (1976), Dore (1974, 1975) and Halliday (1975). The child's communicative efforts after the age of 2 years become complex enough to demand more elaborate differentiation of communicative intent than that described by the above writers. The most comprehensive scheme for describing and coding such intents has been devised by Dore (1977, 1979) on the basis of his work with pre-school children, and it is this scheme which has been adopted for present analysis purposes. Dore fits communicative intentions into a broader model of conversational acts. From his analysis of sessions in which seven 3-year-old children interacted with each other and with their teacher, Dore identified 32 particular illocutionary acts performed by the children, which together accounted for almost all the utterances they produced. These 32 conversational acts were grouped into 6 categories of illocutionary act types, as follows:
1. Requests, which solicit information, actions, or acknowledgements.
2. Responses, which directly complement preceding utterances.
3. Descriptions, which represent observable or verifiable aspects of context, and past or present facts. 4. Statements, which express analytical and institutional facts, beliefs, attitudes, emotions and reasons. 5. Conversational devices, which regulate contact and conversations; and 6. Performatives, which accomplish acts by being said. The conversational acts comprising these 6 major categories are listed and defined in Appendix 10. Each sign, symbol and speech utterance produced by the present subjects was classified as expressing one of these acts. Two additional categories were included, one for utterances which were unintelligible or ambiguous (i.e. where there was insufficient linguistic or contextual information to make a decision as to function), and one to cover 'other' conversational acts (i.e. for utterances which were intelligible but did not fit into any of the specified categories). No utterances were double-coded. For example, utterances which were responses were coded as such, even though they may also have expressed additional functions such as descriptions or statements.

The level of linguistic function captured by this formulation of conversational acts thus concerns children using language to get the attention of others, to solicit and contribute information, to get others to do things for them, to convey attitudes and feelings, and so on. Each scoring of a conversational act is essentially a hypothesis about how the child intends his/her utterance to be taken, and what he/she expects the listener to do about it (Cole, Dore, Hall and Dowley, 1978). The coding of each category is determined by both "internal" grammatical factors and "external" contextual factors. The utterance's literal meaning, its intonational characteristics (if spoken), the child's nonlinguistic behaviour (including gestures and facial expression) and his/her prior and subsequent utterances, the behaviour and utterances of the other person, and the situational context, were all utilized in determining the appropriate conversational act classification of each utterance.

Dore (1977) has reported 82% agreement or better between two experienced judges who independently coded the above categories. Agreement on coding found by the present writer is reported below. But while members of the same cultural and linguistic community may agree in their interpretations of intentions, this fact does not guarantee that the child intended the same interpretation. Thus, even though Dore's classification scheme has shown good overall reliability, it does not necessarily represent a finalized, all-inclusive index of conversational act behaviours. There are still very few studies which assess the acquisition and use of linguistic intentions in normal children, and even fewer in language impaired children. Dore (1977), himself, cautions that given the state of our knowledge about children's pragmatic processing of language, it would be premature to claim absolute validity for the categories, or even that they are arranged in the most descriptively adequate way. The few relevant studies conducted to date indicate that in general language delayed and handicapped children (including augmentative system users) initiate communication infrequently and use a high percentage of naming and answering behaviours (e.g Harris, 1982; MacDonald, 1978). However, further justification of Dore's system in terms of larger samples and different groups of children, is needed.

D. Reliability of the Syntactic, Semantic and Pragmatic Analyses:

Inter-judge reliability for applying the LARSP procedure and for coding the semantic relations and conversational acts expressed by the children, was established by having 15 transcripts (5 speech, 5 Blissymbol and 5 BSL (Makaton) sign transcripts) coded independently by two judges, one of whom was not associated with the investigation. Both judges had available all the utterances produced by the 15 children (the sign and symbol utterances were written in English gloss form), as well as detailed written commentaries on the contexts in which the utterances were produced.

In the case of LARSP procedure, which involves a large number of categories, inter-judge agreement was computed on a subject-by-subject basis. That is, an overall percentage agreement was established for each expressive language sample. For agreements to be registered, both judges had to agree on the word, phrase, clause and/or clause expansion category in which each utterance was placed. Reliability was calculated as a percentage of the number of agreements divided by the total number of agreements and disagreements. Inter-judge agreement on the 5 Makaton sign samples ranged from 72% to 100%, with a mean per cent agreement of 87.2%. Agreement on the 5 Blissymbol samples ranged from 74.1% to 93.3%, with a mean of 84.8% agreement. Agreement on the 5 speech samples ranged from 69.2% to 100%, with a mean per cent agreement of 86.9%. These figures indicate good overall agreement between the two judges in applying the syntactic analysis procedure, despite the large number of LARSP categories involved. Moreover, LARSP appears to be as reliable when applied to sign and symbol utterances, as it is for analyzing spoken utterances.

In establishing inter-judge agreement for the semantic analysis procedure, the first question examined was whether the two judges agreed on the semantic relation expressed by each utterance produced. Agreement was again computed on a subject-by-subject basis, as a percentage of the number of agreements divided by the total number of possible agreements. Agreement on the semantic relations expressed in the BSL (Makaton) utterances was based on the sign protocols of 5 children, covering a total of 160 sign utterances. Percentage agreement for the protocols ranged from 93.3% to 100%. Over all 160 utterances there was 98.1% agreement on the semantic relations expressed. To establish agreement on the symbol utterances produced, the symbol productions of 5 children were used, covering a total of 74 utterances. Agreement on the 5 protocols ranged from 90.9% to 100%, with 97.3% agreement on category assignment over all 74 symbol utterances. Agreement on the 5 speech samples ranged from 88.9% to 100%, with an overall percentage agreement of 97.3% for the 183 spoken utterances produced. Agreements for the semantic analysis of expressive language samples produced in the speech, sign and symbol modes were thus consistently high.

Inter-judge agreement was also computed for the individual semantic categories which were used. For each category, the number of utterances which the judges agreed on placing in that category was divided by the total number of utterances placed in the category (i.e. agreements + disagreements). Inter-judge agreement exceeded 80% for all categories, with the exception of the negation-X and 'unclassifiable' categories, where disagreement was based on only one utterance (see Table 5.1).

Table 5.1: Reliabilities of Categories Used in the Analysis of Semantic Relations

Category	Total Agreements	Total Agreements and Disagreements	Percentage Agreement
Two-term Relations			
Agent-action	21	23	91.3%
Action-object	6	7	85.7%
Agent-object	5	5	100%
Modifier-head	8	10	80%
Negation-X	0	1	0%
Action-location	4	5	80%
Agent/object-location	15	15	100%
Introducer-X	8	9	88.9%
Other	24	28	85.7%
Unclassifiable	0	1	0%
Three-term Relations			
Agent-action-object	5	5	100 %
Experiencer-state-source	5	5	100 %
Introducer-modifier-object	no utterances scored in this category		
Agent-action-location	12	12	100 %
Action-modifier-head	1	1	100 %
Other	16	19	84.2%
Unclassifiable	no utterances scored in this category		
Four-term Relations			
Agent-action-object-location	1	1	100 %
Other	16	16	100 %
Unclassifiable	no utterances scored in this category		

Turning to the coding of conversational acts, the first question again concerned the extent to which the two judges agreed on the pragmatic categories in which utterances were placed. Agreement was based on an utterance-by-utterance comparison. For the 5 BSL (Makaton) samples, per cent agreement ranged from 87.5% to 100%. Over all 160 sign utterances produced by the 5 children, there was 93.1% agreement on category placement. In the case of the 5 Blissymbol samples, per cent agreement ranged from 83.3% to 100%, with 90.5% agreement for the total of 74 symbol utterances produced by the children. Inter-judge agreement on the 5 speech samples ranged from 86% to 100%. Over all 183 spoken utterances, there was 91.8% agreement on category placement.

In contrast to the high overall percentage agreements described above, percentage agreements computed for the individual conversational act categories showed wide variability (see Table 5.2). Agreements on the most frequently used categories, which included action requests, yes/no responses, wh-responses and labelling, were all at the 80% level or above. However, on the infrequently used categories there tended to be very poor agreement between the two judges. This is a common finding for behaviours having a very low base rate, and it is an open question whether such behaviours/categories are scored infrequently because they are difficult to identify, or whether their poor reliability results from their low frequency of occurrence. It is worth noting in this regard that Dore himself only quotes overall reliability for his conversational acts coding scheme (Dore, 1977; Cole, Dore, Hall and Dowley, 1978). Reliable interpretation of the infrequently occurring conversational acts is brought into serious question by the present findings.

Table 5.2: Reliabilities of the Conversational Act Categories. Used in the Analysis of Pragmatic Functions

Category	Total Agreements	Total Agreements and Disagreements	Percentage Agreements
Requests			
Yes/no questions	1	2	50%
Wh-questions	4	4	100%
Action requests	12	15	80%
Permission requests	no utterances scored in this category		
Rhetorical questions	no utterances scored in this category		
Responses			
Yes/no answers	20	23	87%
Wh-answers	171	173	98.8%
Compliances	0	2	0%
Qualifications	3	5	60%
Repetitions	no utterances scored in this category		
Descriptions			
Identifications	84	96	87.5%
Events	39	48	81.3%
Properties	12	20	60%
Locations	21	22	95.5%
Times	no utterances scored in this category		
Statements			
Rules	no utterances scored in this category		
Evaluations	0	5	0%
Internal reports	6	9	66.7%
Attributions	1	4	25%
Explanations	3	5	60%
Organization Devices			
Boundary markers	6	7	85.7%
Calls	1	2	50%
Speaker selections	no utterances scored in this category		
Politeness markers	no utterances scored in this category		
Accompaniments	1	4	25%
Performatives			
Protests, jokes, claims, warnings, teases	no utterances scored in this category		
Uninterpretable	1	4	25%
Other	2	5	40%

19.3.4 Teacher and Parent Questionnaires

The primary goal of augmentative training is communicative interaction in daily living situations. To this end, structured questionnaires were completed by the children's parents, and speech therapists or teachers, at each assessment period, in order to obtain detailed accounts of the children's current patterns of communication at home and at school. A number of different sources were used in constructing the questionnaires, including Bartak, Rutter and Cox's (1977) parent interview schedule, Holt and Reynell's (1967) parent and teacher communication chart, Kiernan's (1981a) Pre-Verbal Communication Schedule, and Kiernan, Reid and Jones' (1982) schools survey questionnaires. Questions were asked about the child's motivation to communicate; the methods of communication used to signal needs and desires, to draw attention to objects or events, and to provide information on past events (whether the child used sounds, pointing, gestures, signs, symbols, speech, or any combination of these modes); the frequency with which the child used signs/symbols to answer questions, express needs and desires, etc.; the range of people with whom the child communicated in general, and using Bliss/BSL (Makaton) in particular (including teachers, parents, siblings, peers and strangers); and the extent to which the child's communicative attempts were understood by the people around him (parents, siblings, extended family, teachers, peers and strangers).

The teachers or speech therapists having primary responsibility for implementing the augmentative communication programme, were also asked to provide information on the techniques they used to teach Bliss/BSL (Makaton) (including emphasis placed on syntax, and extent of adherence to the stages of the Makaton Vocabulary); on the context, length and frequency of the sign/symbol teaching sessions; on time given to additional speech therapy sessions (articulation, feeding and/or comprehension work), and on the frequency with which the systems were used during the school day (i.e. in special sessions only, during all class lessons, at other times etc.). The instructors were also asked to give their reasons for deciding to use either Blissymbolics or BSL (Makaton) with the children (e.g. absence of expressive language, failure in other programmes, easy for the child or staff to learn etc.).

A major factor in the success of a communication programme is the receptiveness and willingness of those in the child's environment to implement whichever system is chosen for use. As Ferrier and Shane (1983) point out, a child's motivation to use a communication system stems from its functional application with significant and caring others, with whom the desire to communicate has its origins. This may be of even greater importance with regard to augmentative systems, since the communication partners must invest time and effort in learning the system and in encouraging the child to use it. In view of this, the parents were also asked to rate their attitude to the use of signs/symbols with their child on a 5-point scale (ranging from 'fully in favour' to 'opposed to their use'), and to describe their perception of the advantages and disadvantages of augmentative communication system use. Finally, on the basis of the parents' responses to the questionnaire as a whole, the present writer made a subjective judgement (rated on a 4-point scale) of the extent to which parents used Bliss/BSL (Makaton) with their child in the home.

The parent and teacher questionnaires are presented in Appendices 11 and 12. The teacher questionnaires were administered in interview form during the first (baseline) assessment period, and then left for the speech therapists or teachers to complete on their own at the three follow-ups. Parent questionnaires were sent to the child's home, together with an explanatory letter and stamped envelope for return postage, except for a few cases where the school felt that the parents might have difficulty in completing the questionnaires. In these cases the parents were visited at home, and the questionnaires were administered in interview form. There was a 100% return rate for the parent questionnaires which were sent by post; although in a few cases reminders had to be sent to those parents who failed to return their forms initially.

19.4 Behavioural Measures and Social Development

A. Rutter's Teacher and Parent Questionnaires (Rutter, 1967; Rutter, Tizard and Whitmore, 1970):

The assessment of emotional and behavioural disturbance was based on two measures - the Rutter child Scale A, consisting of 31 items for completion by parents, and child Scale B, consisting of 26 items for completion by class teachers. The scales consist of a series of behavioural descriptions, for each of which the informant is asked to mark whether the description 'does not apply', 'applies somewhat' or 'certainly applies' to the child. Replies are given a weight of 0, 1 and 2 respectively, and scores for individual items are summed to obtain a total score for each scale. Rutter et al.(1970) recommend the use of a cut-off score of 13 or more on Scale A and 9 or more on Scale B, in order to identify children with a high level of reported problem behaviours. In addition to the total scores, subscale scores are obtained on symptom clusters of 'neurotic' and 'antisocial' behaviour. The children identified as scoring above the cut-off levels are classified into the neurotic or antisocial categories by a comparison of their total scores on these subscales. The larger of the two scores determines the particular category, while those children with equal neurotic and antisocial scores are categorized as 'undifferentiated'. A recent factor analysis of the scales found a separate 'hyperactivity' factor (Schachar, Rutter and Smith, 1981), defined by adding the scores on the following items: 1. Very restless, has difficulty staying seated for long. 2. Squirmy, fidgety. 3. Can't settle to anything for more than a few moments. Scores for this factor range from 0 to 6, and hyperactivity is considered to be present when the factor score is 3 or more on either the parent or teacher scale. In the present study, the Rutter scales were completed by the children's parents and teachers at baseline and final follow-up period only.

Rutter (1967) and Rutter, Tizard and Whitmore (1970) found quite high test-retest and inter-rater reliability values for the scales. The 3-month retest correlation was 0.74 for the parental scale and 0.89 for the teacher scale, although stability between teacher questionnaire scores at ages 10 and 14 years was much less (0.29). The correlation between the total scores of fathers and mothers was 0.64, and between the scores of 2 teachers it was 0.72. Teacher and parent questionnaire scores have also been shown to differentiate well between children who were and were not attending a psychiatric clinic, and to be significantly associated with psychiatric disorder as diagnosed from standardized interviews, in groups of children sampled in London and the Isle of Wight. Rutter (1967) found that a total score of 9 or more on the teacher questionnaire selected 72 - 88% of boys attending a child Guidance Clinic, but only 9 - 11% of boys in the general population. Similarly, 50 - 70% of clinic girls scored 9 or more, compared with only 3 - 5% in the general population. These findings were further validated in the Isle of Wight study (Rutter et al., 1970), although the discriminations were not as sharp. Of the 9- to 12-year-old children finally diagnosed as showing psychiatric disorder, 53% scored 9 or more on the teacher questionnaire, compared with 7.1% of the general population, and 54.5% scored 13 or more on the parent questionnaire, compared with 6% in the general population. The questionnair subscores also gave good indications of the type of psychiatric disorder diagnosed (i.e. neurotic or antisocial disorder).

The Rutter Scales have thus been shown to be reliable and valid instruments, at least for general child populations. However, it must be noted that the questionnaires were originally standardized on a general sample of 10- and 11-year-old children. Some results have since been reported on the use of the scales with samples of 7- and 8-year-old children (McGee, Silva and Williams, 1984; Rutter, Tizard, Yule et al., 1976;

Stevenson, Richman and Graham, 1985); and Rutter, Graham and Yule (1970) reported on a group of 5- to 14-year old children with neuro-epileptic disorders (including cerebral palsy), 32% of whom obtained scores of 9 or more on the Teacher Questionnaire, and 25% of whom obtained scores of 13 or more on the Parent Questionnaire. However, there is no other information bearing upon the utility of the scales with children such as those used in the present study, who are younger than 10 years, and are also physically handicapped. It is recognized that the items on the scales vary in importance as indications of deviant behaviours with the age and handicaps of the child. For example, the scales include an item on enuresis and other indices which are not necessarily abnormal for 4- and 5-year-olds or for older children who are severely physically handicapped. Moreover, some of the items were simply not applicable to the nonverbal cerebral palsied children comprising the present sample (e.g. truanting from school, telling lies), while other items were, by definition, applicable in all cases (e.g. speech difficulties). Since there is minimal information on the validity of the recommended cut-off scores on the scales with such children, it was decided to adopt Rutter's scales and procedures in their entirety, while at the same time recognizing the potential limitations of their application in the present study.

B. The Needleman Questionnaire (Needleman, Gunnoe, Leviton et al., 1979):

A number of writers have highlighted the learning handicaps and attending difficulties which characterize many cerebral palsied children (see Chapter 2). In view of this, teachers were also asked to complete the Needleman Questionnaire, which seeks to evaluate general classroom behaviour, with particular focus on attention (see Appendix 13). This 11-item forced-choice behavioural rating scale was devised by Needleman for evaluating the neuropsychological effects of childhood exposure to lead. Each item is scored as 'yes' or 'no', and total scores are obtained based on the sum of 1 point per negative report on each item.

To date there are no published data on the derivation of the scale or its reliability. Needleman, Gunnoe, Leviton et al. (1979) found that negative teacher ratings related closely to tooth lead levels in over 2000 first- and second-grade American children. Similarly, Lansdown, Yule, Urbanowicz and Millar (1983; Yule, Urbanowicz, Lansdown and Millar, 1984) found a (nonsignificant) trend for total scores on the scale to increase with increasing blood lead levels in 166 English children aged 6 to 12 years. In 5 of the 11 questionnaire items there was a significant trend for children with higher blood lead levels to receive more negative ratings, and in 4 other items children with the lowest blood lead levels received fewer negative ratings than those with higher blood lead levels. Lansdown et al.further found that scores on the scale were highly related to scores on the Rutter Child Scale B (Rutter, 1967) and to the WISC-R Full Scale IQ (Wechsler, 1974). Yule et al.conclude that the Needleman questionnaire appears to tap broadly similar areas to the Rutter Scales and also the Conners Scale (Conners, 1969), but is more sensitive to body lead levels. They suggest that this may be because it is more specific in its apparent emphasis on the child's ability to focus attention in relatively structured class learning situations. Additional research on the validity of the questionnaire is clearly needed.

It must also be stressed that the Needleman questionnaire has to date only been applied to essentially normal samples of children. The present study constitutes the first attempt to use this scale to evaluate the classroom behaviour of language impaired physically handicapped children.

C. Observation of Attending Ability:

Teacher and parent rating scales, while easily obtained and demonstrating some validity, have limited value for a precise quantification of discrete deviant behaviours, since they are not designed to cope with situational variability (Luk, 1982). Furthermore, they interpose the judgement of another adult between the investigator and the behaviour. In view of this, the use of the Rutter and Needleman questionnaires in the present study was supplemented by direct observation, to assess activity and attending ability as shown during participation in a teacher-led structured group activity in the classroom. A 5-minute time sampling technique was used, comprising 15 10-second periods for observation, each followed by a 10-second period for recording. Six separate categories of activity and attentional behaviour were recorded as 'occurring' or 'not occurring' during each 10-second observation period, as follows: 1. Gross body movement. 2. Gaze aversion. 3. Off task. 4. Irrelevant vocalizations. 5. Reaching objects, and 6. Interference. These categories were developed by Abikoff, Gittelman-Klein and Klein (1977) and Sandberg, Rutter and Taylor (1978). The definitions and criteria for scoring each category are presented in Appendix 14. Total scores, i.e. 5-minute sums of each of these 6 behaviours, were obtained for the purposes of data analysis, as well as a total attention score, which was derived by summing over all 6 categories and over all time intervals.

High inter-rater reliability coefficients have been reported for scoring these behavioural categories. Sandberg et al.obtained inter-rater correlations of between 0.97 and 0.99 for the categories of 'gross body movements', 'irrelevant vocalizations' and 'reaching objects'. Abikoff et al.reported reliability coefficients of about 0.81 for the 'interference' category, and of about 0.71 for the 'off task' category; and Whalen, Henker, Collins, Finck and Dotemoto (1979) found reliability values of 0.83 for the 'movement' category, 0.96 for 'irrelevant vocalization', and 0.95 for a category of 'aggressive/negative contact' (similar to the 'interference' category above).

In the present study, the inter-observer reliability of these six activity/attention categories was tested by comparing the simultaneous recordings of two observers with 10 children. For each recording period, the reliability observer was cued to start and finish observing, but carried out all observations and recordings independently. Agreements and disagreements were scored according to whether each of the observers recorded the presence or absence of each behaviour on an interval by interval basis. The reliability index was then calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Per cent agreement for each subject over all 6 categories was high, varying between 93.3% and 100%, with a mean of 97.8% agreement. Agreement was also assessed for the individual activity/attention categories, in order to determine whether any gave rise to the greatest disagreement. On the category of 'gross body movements', agreement for each of the 10 children ranged from 93% to 100%. The overall kappa value for this category was 0.96. On the category of 'gaze aversion', inter-observer agreement varied between 80% and 100%, and the overall kappa value was 0.90. For 'off task' behaviours, observer agreement ranged from 73.3% to 100% for each of the 10 children, with an overall kappa value of 0.92. Finally, for each of the categories of 'irrelevant vocalizations', 'reaching objects' and 'interference', kappa had a value of 1.00, i.e. there was perfect agreement between the two observers for all 10 children and for every observational time period. All kappa values were significant at the .001 level, indicating good agreement on assessing the subjects' activity and attending abilities in a structured observational setting.

On the question of the validity of these observational measures, Sandberg et al.(1978) found no association between the total score based on observation of activity/attention behaviour and the Conners' Teacher and Parent Questionnaires (Conners, 1973). They suggest that this is because the overactive behaviour measured in observation is situation-specific. On the other hand, they did find that children diagnosed clinically as being hyperactive had a mean observation score on over-activity/inattention which was twice that of children with conduct disorders.

Abikoff et al. (1977), too, found that observational ratings of 'off task' and 'interference' behaviours discriminated between normal children and those rated as hyperactive by parents and teachers.

D. Progress Assessment Charts (P-A-C) - Socialisation and Self-Help Scales (Gunzburg, 1977):

The P-A-C constitutes an inventory of skills contributing to social competence, which was designed specifically for use with mentally handicapped individuals. The skills are distributed among the four areas of self-help, communication, socialisation and occupation, and are arranged into three basic P-A-C forms and three special P-A-C forms. These six forms contain selections of self-help and social skills, placed more or less hierarchically with respect to one another, which are relevant to the following mentally handicapped groups - children aged up to 7 years or older children presenting severe problems of management (P-P-A-C), children aged 6 to 16 years or older (P-A-C-1, P-A-C-1A), adolescents and adults (P-A-C-2), children with Down's syndrome (M/P-A-C-1), and severely mentally handicapped adults (S/P-A-C). Gunzburg further provides Progress Evaluation Indices which give information relating to the 'average achievement levels' in the various subsections of the P-A-C, to allow for a comparison of an individual's performance with that of children or adults with a similar degree of mental handicap.

Fifty one relevant items from the self-help and socialisation scales of two P-A-C forms (forms P-P-A-C and P-A-C-1) were selected for rating in the present study. The items are grouped into the following categories - table habits (9 items), toileting (7 items), dressing (11 items), and socialisation (24 items). The inventory, which is presented in Appendix 15, was completed by parents, and marking was by a simple point score, with each item passed scoring 1 point. Gunzburg's expectancy levels could not be used for present purposes since the populations on which these were based do not include physically handicapped children. Therefore, only raw score totals could be derived for each category. It must be stressed that the development of cerebral palsied children does not always follow the normal pattern, nor, for that matter, the pattern exhibited by mentally handicapped children. Cerebral palsied children frequently do not qualitatively demonstrate behaviour specified on most checklists. As Campbell (1979) has pointed out, most checklists and scales focus on terminal responses and do not describe the type(s) of movement patterns used to perform a given response. Scale items thus imply normal patterns of movement and behaviour, but do not operationally define these patterns in a way that makes the checklists valid with motor dysfunctional children. This limitation on using the P-A-C cannot be minimized. Moreover, there will be many self-help and social skills which cannot be practised because of the child's physical handicap, or because the environment is so sheltered as not to provide opportunities for learning and observing. Children were not credited for skills they might have been able to exercise but for such adverse circumstances. The P-A-C record simply indicates that a particular social skill is not available to the child, but does not give information on why this is so.

As noted above, Gunzburg provides norms for specific subgroups of mentally handicapped individuals. However these are based on very small samples (e.g. 200 Down's Syndrome children). General norms are not available; nor is there information on the use of the P-A-C with physically handicapped children or adults. There are no reliability data on the charts, and minimal validity data. Elliott and MacKay (1971) found a close relationship between P-A-C scores and the Vineland Social Maturity Scale, in groups of mentally handicapped adolescents and younger normal children. They reported an overall correlation coefficient of 0.86 between the two measures, and separate subscale correlations of between 0.72 (for occupation) and 0.82 (for communication). The P-A-C scores further differentiated between institutionalized and non-institutionalized mentally handicapped adolescents. Significant, but lower, correlations have also been found with Stanford-Binet IQs (Elliott and MacKay, 1971) and with the Stanford-Binet Vocabulary Test (Marshall, 1967, in Gunzburg, 1977), suggesting that the rating of social competence depends to some extent on intelligence and developmental level. As already stated, motor abilities, exposure to relevant experiences, and opportunities for practice, are also likely to play a part in performance on the P-A-C scales.

PART V: RESULTS - THE CHILDREN AT BASELINE

Chapter 20. Demographic Characteristics of the Bliss and Makaton Signing Groups

Overall, the 40 children ranged in age from 3 years 6 months to 9 years 8 months (mean = 71.98 months, S.D. = 18.36). The 20 Bliss Users had a mean age of 72.10 months (S.D. = 16.54), and the 20 BSL (Makaton) Users a mean age of 71.85 months (S.D. = 20.46). There was no significant difference between the groups in terms of age (t = 0.04, d.f. = 38), nor in terms of sex distribution (χ^2 = 0.40, d.f. = 1). The Bliss Users group consisted of 9 boys and 11 girls, and the BSL (Makaton) group of 12 boys and 8 girls. In the total sample, then, there was a slight preponderance of boys, with a ratio of 1 girl to 1.11 boys. Social class was assessed from father's occupation (or mother's occupation, in single parent families), based on the Office of Population Censuses and Surveys' Classification of Occupations (1980). The social class distribution of the children in the 2 groups is shown in Table 6.1. As was the case for

Table 6.1: Social Class Distribution

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
Social class	n	%	n	%
I and II	6	30	4	20
III (non-manual)	1	5	4	20
III (manual)	10	50	7	35
IV and V	1	5	2	10
Unemployed	2	10	2	10
Unknown	0	0	1	5

age and sex, there was no significant difference between the 2 groups on this measure (χ^2 = 4.83, d.f. = 7).

Additional information was obtained on the children's home backgrounds in terms of the number of children who were living at home or in care, the number of siblings, the number of children who had working mothers, the country of origin of the parents, and the language(s) spoken at home. As can be seen in Table 6.2, the majority of children (85%) were living at home with both parents; 5 children were in single parent families, and only 1 child was in care. Moreover most mothers did not work outside the home, with the exception of only 2 mothers who worked part-time and 1 mother who worked full-time. This finding is in accord with a number of

Table 6.2: Parental Care

	Bliss Users (n= 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Living with both parents	18	90	16	80
Living with single parent	2	10	3	15
In care	0	0	1	5
Mother not working	19	95	18	90
Mother working part-time	1	5	1	5
Mother working full-time	0	0	1	5

studies which have found that mothers of handicapped children are much less likely to work than are mothers in general (Philp and Duckworth, 1982). Again, there were no significant differences between the Bliss Users and Makaton Signers on these 2 variables ($\chi^2 = 1.32$, d.f. = 2; $\chi^2 = 1.03$, d.f. = 2). In terms of birth order of the children, there was a wide spread of only, younger/est, middle and elder/est children (see Table 6.3). The group as a whole had a mean of 1.30 siblings (S.D.= 1.22, range 0 - 6 siblings). While there was a tendency for more Bliss Users

Table 6.3: Ordinal Position

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Elder/est	7	35	3	15
Younger/est	6	30	8	40
Only	4	20	6	30
Other	3	15	3	15

than Makaton Users to be elder/est children, and to have more siblings (mean of 1.55 siblings for the Bliss group compared with 1.05 for the Makaton group), these differences between the 2 groups were not statistically significant ($\chi^2 = 2.29$, d.f. = 3; $t = 1.30$, d.f. = 31.24).

As shown in Table 6.4, Britain was the country of origin of the majority of parents, and English was in most cases the only language spoken at home. The Bliss and BSL (Makaton) groups did not differ significantly in terms of parents' country of origin and home language ($\chi^2 = 5.09$, d.f. = 2, $P = .078$; $\chi^2 = 3.80$, d.f. = 2, $P = .150$), but it is interesting to note that, in the case of country of origin, the

Table 6.4: Country of Origin and Home Language

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Parents' country of origin				
Britain	14	70	19	95
Other European countries	2	10	1	5
Asia	4	20	0	0
West Indies	0	0	0	0
Africa	0	0	0	0
Language spoken at home				
English only	15	75	19	95
Predominantly English + other	2	10	1	5
Predominantly non-English	3	15	0	0

difference was not far off significance. Four Bliss Users, but no Makaton Signers, had parents of Asian origin, and of the 4, 3 families did not use English in the home. There is no ready explanation for this trend, which may well be a chance finding. On the other hand, allocation of children to the Blissymbolics and BSL (Makaton) groups by schools was not random. As will be shown below, the Bliss Users were significantly more physically disabled than the Makaton Users, but they were also more able intellectually. It may be that, for whatever reason, a higher proportion of Asian cerebral palsied children show one or both of these characteristics, when compared with the total group of cerebral palsied children, and that they are consequently more likely to be assigned to Blissymbol teaching than to BSL (Makaton) teaching. However, the present writer is aware of no epidemiological studies of cerebral palsy which might help to shed light on this question.

To sum up, the Blissymbol Users and Makaton Signers did not differ significantly on any of the demographic variables which were examined. However, the 2 groups were found to be significantly different on measures of physical handicap and cognitive skills, and a discussion of these differences, and of the children's abilities in these areas, now follows.

Chapter 21. Physical Handicaps

21.1 The Physical and Motor Status of the Blissymbol Users and Makaton Signers

The children were rated by their speech therapists or teachers on severity of handicap, in terms of the extent to which their disabilities interfered with daily life (see Appendix 3 for the criteria used to rate this measure). Over all 40 children, 37.5% were rated as having a slight or moderate degree of handicap, while 62.5% were severely to totally incapacitated. The severity of handicap in each group is shown in Table 7.1. In the Bliss Users group, 95% of the children were rated as being severely or totally physically handicapped, while of the Makaton Signers less than one-third were severely/totally handicapped and just over two-thirds were rated as having only a slight or moderate degree of handicap.

Table 7.1: Severity of Handicap

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
None	0	0	0	0
Slight	0	0	3	15
Moderate	1	5	11	55
Severe	6	30	4	20
Total/almost total	13	65	2	10

On statistical testing, the Bliss group emerged as significantly more physically handicapped than the BSL (Makaton) group on this measure (χ^2 = 19.80, d.f. = 3, $P < .001$), as well as on the postural control measures of head control (χ^2 = 10.23, d.f. = 1, $P = .001$), locomotion ability (χ^2 = 18.62, d.f. = 2, $P < .001$), sitting (χ^2 = 20.03, d.f. = 2, $P < .001$), and standing ability (χ^2 = 19.07, d.f. = 4, $P = .001$). As can be seen in Table 7.2, between 90% and 95% of the Bliss Users group

Table 7.2: Postural Control

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Head control				
Full control	6	30	17	85
Can hold head up - 5 sec. plus	14	70	3	15
Can turn head when lying down	0	0	0	0
No control	0	0	0	0
Locomotion				
Independent (walks unaided)	1	5	12	60
Partially dependent (walks with help, crawls)	7	35	7	35
Totally dependent	12	60	1	5

Table 7.2 cont'd	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Sitting				
Can sit steadily and safely	2	10	16	80
Needs some support	6	30	2	10
No control for sitting	12	60	2	10
Standing				
Can stand firmly and steadily	0	0	7	35
Can stand - unsteady	1	5	7	35
Needs some support (eg. leaning)	1	5	1	5
Needs considerable support (eg. frame)	12	60	4	20
Unable to stand however supported	6	30	1	5

had poor to no control for sitting, standing and ambulation, compared with only 20% to 40% of Makaton Users. Further support for these conclusions comes from analysis of the children's performance on the P-A-C Mobility and Agility Scales (see Table 7.3). On both scales, the BSL (Makaton) Signers passed significantly more checklist items than the Bliss Users; however even the Signers were, on average, able to perform only around half of the 13 Mobility Scale items and 20 Agility Scale items.

Table 7.3: Performance on the P-A-C Mobility and Agility Scales

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)			
	Mean	S.D.	Mean	S.D.	*t*	*P*
P-A-C Mobility Scale	2.60	2.89	8.65	2.75	6.79	<.001
P-A-C Agility Scale	5.05	1.79	10.65	3.36	6.58	<.001

The above findings on physical handicap are also reflected in the significantly different distributions of diagnostic categories (types of cerebral palsy) found in the 2 groups ($\chi^2 = 19.78$, d.f. = 5, $P = .001$). As shown in Table 7.4, about two-thirds of the Bliss group were spastic quadriplegics or athetoids; 10% fell into the 'mixed' category, and 15% into the 'other' category. By contrast, over two-thirds of the children using BSL (Makaton) were spastic hemiplegics or diplegics; only 15% were quadriplegics, and none were athetoids. It should be noted that spastic quadriplegia and athetosis are in general terms more severely physically disabling conditions than hemiplegia or diplegia. For elaboration on this point, the reader is referred to Table 7.5, which presents the distribution of cerebral palsy sub-types by severity of handicap for the total group. As shown in the table, the hemiplegic cases (and some

Table 7.4: Types of Cerebral Palsy in the Bliss and BSL (Makaton) Groups

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
Diagnostic category	n	%	n	%
Spastic hemiplegia	0	0	7	35
Spastic diplegia	2	10	7	35
Spastic quadriplegia	6	30	3	15
Athetosis	7	35	0	0
Ataxia	0	0	0	0
Mixed	2	10	0	0
Other	3	15	3	15

Table 7.5: Distribution of Cerebral Palsy Sub-types According to Severity of Handicap (n = 40)

	Severity of handicap							
	Slight		Moderate		Severe		Total	
Diagnostic category	n	%	n	%	n	%	n	%
Spastic hemiplegia	2	5	5	12.5	0	0	0	0
Spastic diplegia	1	2.5	4	10	3	7.5	1	2.5
Spastic quadriplegia	0	0	1	2.5	3	7.5	5	12.5
Athetosis	0	0	0	0	2	5	5	12.5
Ataxia	0	0	0	0	0	0	0	0
Mixed	0	0	0	0	0	0	2	5
Other	0	0	2	5	2	5	2	5

diplegics) tended to be rated as having only slight to moderate degrees of physical handicap, whereas the spastic quadriplegic and athetoid cases were almost all rated as having severe to total degrees of physical handicap. The strength of the association between cerebral palsy sub-type and severity of handicap, which is given by Cramer's V (Blalock, 1972), although modest (0.47), is significant at the .03 level.

Disabilities found in past research to be strongly associated with cerebral palsy include visual impairments, auditory impairments and epilepsy (see Chapter 2). In the present sample, only 2 Bliss Users and 1 BSL (Makaton) User had a moderate hearing loss (7.5% of the total sample), and 1 child in each group was partially sighted (5%). Squint affected 4 Bliss Users and 6 Makaton Signers (25% of the total sample), and nystagmus was reported for 2 Makaton Signers. These results are tabulated in Table 7.6. Thus 80% of the children using Blissymbolics and 55% of the children using BSL (Makaton) were free of visual defects. The difference between the Bliss and Makaton groups on these visual handicap measures were not significant. It must of course be remembered that information on the children's visual and hearing difficulties was obtained from their medical records, and it is possible that these records may in some cases have been inadequate or incomplete.

According to parents' reports, significantly more Bliss Users (50%) than BSL (Makaton) Users (5%) had had fits in the first 2 weeks of life ($\chi^2 = 10.36$, d.f. = 2, P = .006); but roughly the same numbers of children in each group had had 1 or more epileptic fits since the age of 2 weeks and up to the time of baseline assessment ($\chi^2 = 1.25$, d.f. = 3; $\chi^2 = 0.00$, d.f. = 2) (see Table 7.6). Of the Bliss group,

Table 7.6: Frequency of Hearing and Visual Impairments, and Epilepsy

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Hearing impairments				
Moderate hearing loss	2	10	1	5
Severe to profound hearing loss	0	0	0	0
High frequency loss	0	0	1	5
Visual Impairments				
Partially sighted	1	5	1	5
Blind	0	0	0	0
Strabismus	4	20	6	30
Nystagmus	0	0	2	10
Other disabilities	0	0	1	5
Epilepsy				
Fits in 1st 2 weeks of life	10	50	1	5
1 - 2 fits since age 2 weeks	1	5	2	10
3 or more fits since age 2 weeks	5	25	6	30
1 - 2 fits in past year	2	10	2	10
3 or more fits in past year	1	5	1	5

1 child had 2 fits and 5 children had 3 or more fits since the age of 2 weeks; and of the Makaton group 2 children had 1 to 2 fits, and 6 children had 3 or more fits since the age of 2 weeks. In other words, 35% of the total sample of 40 children had had 1 or more epileptic fits, not counting those with convulsions in the first 2 weeks of life. At the time of baseline assessment, 3 children in each group (15%) were on

anticonvulsant medication, and for 2 of them the fits were fully controlled by the medication. The remaining 4 children, and 2 additional children (i.e. 15% of the total sample) had experienced 1 or more fits in the year preceding the study. Four of these children (2 Bliss and 2 Makaton Users) had 1 fit in the year preceding the study, and 2 children (1 in each group) had 3 or more fits in this period. According to parents' descriptions of the fits experienced by these children, 3 of the 6 had only major attacks, defined by Rutter, Graham and Yule (1970) as fits in which there is a loss of consciousness and convulsions, often accompanied by incontinence and lip/tongue biting; 2 children had pure petit mal, defined as episodes of loss of consciousness lasting only a few seconds, occurring without warning and unaccompanied by loss of posture, tongue-biting or incontinence; and in 1 child focal attacks occurred in association with major fits.

21.2 Intercorrelations Among the Measures of Physical and Motor Status

As detailed above, a number of different measures were used to describe the children's motor abilities and physical status. Nonparametric correlation procedures were employed to examine the relationships among these ordinal-level variables over the total group, and in each of the Bliss and BSL (Makaton) groups separately. Table 8 presents the resulting Kendall rank-order correlation coefficients for the total sample of 40 children. In this table, and throughout the text, a single asterisk (*) represents a probability level of <.05, and 2 asterisks (**) indicate a probability level of <.001. As can be seen, the intercorrelations between the measures of severity of physical handicap, P-A-C Mobility and Agility scores, head control, locomotion, sitting and standing, were all significant at the .001 level, with the Kendall correlation coefficients ranging from 0.64 to 0.83. By contrast, the measures of hearing and visual impairment, and epilepsy, did not correlate significantly with any of the above measures, nor with each other, with the exception of a significant correlation between the number of fits children had had since the age of 2 weeks and the number of fits they had in the year preceding the study. In this regard it must be pointed out that each of these latter measures comprised only 4 ordinal scale categories. Furthermore, very few children were found to have any degree of hearing or visual impairment (7.5% and 5% of the sample respectively), and 65% of the sample did not have epilepsy. Since the magnitude of correlation coefficients depends on the range of

Table 8: Intercorrelations Among Measures of Physical and Motor Status - The Total Group (n = 40)

	Mobil	Agil	Head	Loc	Sitting	Standing	Hearing	Acuity	Fits 1	Fits 2
PH	-0.75**	-0.75**	-0.64**	-0.80**	-0.82**	-0.78**	-0.09	0.01	-0.09	-0.10
Mobility		0.83**	0.71**	0.80**	0.79**	0.70**	0.10	0.03	0.09	0.10
Agility			0.66**	0.74**	0.76**	0.64**	0.11	-0.02	0.03	0.07
Head				0.77**	0.69**	0.69**	0.05	-0.04	-0.13	-0.06
Locomotion					0.79**	0.82**	-0.11	0.13	0.06	0.00
Sitting						0.74**	0.17	-0.02	0.02	0.04
Standing							-0.03	0.11	0.06	-0.07
Hearing								-0.07	0.01	0.17
Acuity									0.09	-0.10
Fits 1										0.56**

Key:
PH : Severity of physical handicap
Mobil : P-A-C Mobility Scale
Agil : P-A-C Agility Scale
Head : Head control
Loc : Locomotion
Hearing: Extent of hearing loss
Acuity : Extent of impaired acuity
Fits 1 : No. of fits since age 2 weeks
Fits 2 : No. of fits in past year

variability in the variables in question, the absence of significant correlations for these measures is only to be expected.

Intercorrelations among the measures of physical and motor status were also examined in the two groups separately, and the resulting correlation coefficients are presented in Appendix 16. With very few exceptions, the pattern of significant intercorrelations found in each of the 2 groups was identical to that found in the total sample; although with reduced sample size and reduced variability in the measures, the sizes of the correlation coefficients were in most cases understandably lower.

In view of the significant intercorrelations that were found between the ratings of severity of handicap, mobility, agility, head control, sitting and standing, the measure of severity of handicap was chosen for convenience as the representative measure of physical status to be used in all subsequent analyses.

Chapter 22. The Children's Cognitive and Perceptual Abilities

22.1 Performance on the Cognitive and Perceptual Measures

The distributions of Columbia Mental Maturity Scale (CMMS) Age Deviation Scores are shown in Table 9.1. The reader is reminded that

Table 9.1: CMMS IQ Scores

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
IQ	n	%	n	%
110 or above	1	5	0	0
90 - 109	4	20	2	10
70 - 89	6	30	4	20
56 - 69	5	25	3	15
55 and below	4	20	11	55

because the CMMS is a nonverbal, multiple choice selection test, it is particularly suitable for use with cerebral palsied children, since responses are not dependent on verbal ability or fine motor skills. Nevertheless, the difficulties inherent in psychological testing of this population are well known (see Chapter 19). Moreover, a number of researchers have suggested that the CMMS may underestimate IQ in cerebral palsied children (eg. Nicholson, 1970). While this claim has not been elaborated upon in the literature, the implication is that the scores of the present sample should, if anything, be regarded as underestimates of cognitive level. However, if the present IQ scores are accepted (even if only as an approximate indication of nonverbal intelligence), they show that 57.5% of the total sample were mentally handicapped, a finding which is close to the rate quoted in epidemiological studies of cerebral palsy (eg. Rutter, Graham and Yule, 1970). Comparison of the present findings with those reported in other studies will be discussed in greater detail in Chapter 23.

Turning to examine the differences in intelligence between the Bliss Users and Makaton Signers, it can be seen that 55% of the Bliss group but only 30% of the BSL (Makaton) group had CMMS IQs of 70 or above. On statistical testing, the Bliss Users achieved significantly higher scores than the Makaton Signers on the Columbia Interlevel Scale, as well as higher raw scores on the Raven's Coloured Progressive Matrices (Set A) and on the Pre-symbol Assessment Test (which involves matching and identification of pictographic symbols) (see Table 9.2).

Table 9.2: Performance on the Columbia Interlevel Scale, Raven's CPM and Frostig DTVP

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)		
	Mean	S.D.	Mean	S.D.	t
Columbia Interlevel Scale	253.35	35.17	211.55	36.84	3.67**
Raven's CPM (Set A)	4.60	2.26	2.25	2.15	3.37*
Frostig Perceptual Ages (mnths)					
Form Perception	57.30	18.18	39.30	10.75	3.81**
Position in Space	49.95	15.43	39.40	11.38	2.41*
Pre-symbol Assessment	23.15	5.84	14.00	8.05	4.12**

The Bliss Users also achieved significantly higher perceptual ages on the 2 subtests of the Frostig DTVP which were used (Form Perception and Position in Space). The present writer has already cautioned that modifications in the responses that were accepted on the Frostig subtests (pointing rather than pencil outlining), and the fact that the tests were not standardized on physically handicapped populations, render the obtained perceptual ages inappropriate for descriptive purposes or for comparison with the Frostig norms. However, it is interesting to note that whereas the Makaton Signing group obtained a mean perceptual age of 3.03 years on both the Form Perception and Position in Space subtests, the average performance of the Bliss Users group was relatively poorer on the Position in Space subtest (a mean age of 4.02 years) when compared with performance on the Form Perception subtest (yielding a mean age of 4.09 years). A tentative explanation for this discrepancy may be that the significantly greater physical handicaps of the Bliss Users differentially affected their performance on the 2 subtests; that is, performance on the Position in Space subtest, involving as it does the discrimination of reversals and rotations of figures, may be more reliant on motor ability than is the Form Perception subtest. The lack of information in the research literature on exactly what each subtest is measuring, or on the (possibly different) skills implicated in performance on the 2 subtests, renders this suggestion highly tentative. Moreover, it should not be forgotten that even on the Position in Space subtest, the Bliss group achieved a significantly better average performance, when compared with the BSL (Makaton) group. An additional point to bear in mind regarding this issue, is that the 2 groups had already been exposed to sign/symbol training for an average of 10 months prior to the commencement of the study and the baseline testing (see Chapter 24). It is possible that the training each group received differentially affected performance on the 2 Frostig subtests and the Pre-symbol Assessment, and perhaps also on the CMMS and Raven's CPM (which all involve the identification and matching of geometric forms, symbols or patterns), thereby contributing to the significantly different mean scores shown in Table 9.2.

In sum, the present results show that the Bliss Users were not only more severely physically handicapped than the Makaton Signers, but also achieved significantly higher scores on the nonverbal cognitive and perceptual measures that were used.

These findings confirm the conclusion reached by Kiernan, Reid and Jones (1982), which was based on postal surveys of the use of sign and symbol systems in U.K. schools, that differential placement in augmentative communication programmes occurs on the basis of such overt factors as physical ability and cognitive level. British Sign Language signs, used within the framework of the Makaton Vocabulary, are favoured for severely mentally handicapped children who tend not to be very severely physically handicapped; while Blissymbolics tends to be used with severely physically handicapped children who are more able intellectually. As Kiernan, Reid and Jones (1982) suggest, it seems likely that schools are excluding many low cognitive ability children from Blissymbol programmes because they believe that the children would be unable to cope with the system. A related factor to bear in mind in this regard is that the <u>types</u> of schools attended by the Bliss and BSL (Makaton) Users were significantly different ($\chi^2 = 22.62$, d.f. $= 4$, $p < .001$), with 70% of BSL (Makaton) Users coming from ESN(S)/(M) Schools, and all the Bliss Users coming from PH Schools or Units or Hospital Schools (see Table 9.3.) Thus differential placement in sign and symbol programmes appears to take place as much because of the availability of the systems (with BSL (Makaton) being most widely used in ESN(S) Schools, and Blissymbolics in PH Schools), as through gross matching with levels of physical and mental handicap. Interestingly, an American survey conducted by Fristoe and Lloyd (1978) pinpointed expertise of teachers (i.e. familiarity of school staff with a particular system), rather than the needs of the child, as being the most critical factor in system selection. Jernqvist (1981), in a survey of augmentative system use in Spastic Society schools in England, similarly found a tendency for just one system to be operative in a given school, with all nonverbal children in the school being exposed to that one system. Recently, it has become clear that there are many factors to

Table 9.3: School Placement

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
PH School	14	70	3	15
PH Unit in ordinary school	1	5	0	0
Hospital School	5	25	3	15
ESN(S) School	0	0	13	65
ESN(M) School	0	0	1	5

be considered when selecting an augmentative communication system for a given child. These factors were discussed in some detail in Chapters 7 and 12, and are likely to include not only the child's motor and cognitive abilities, but also the receptiveness of the people in the child's environment to sign versus symbol systems, the child's inclination and potential to express him/herself using gestures versus symbols, the child's receptive and expressive language status, and the efficiency of the systems themselves - for example in terms of speed of communication and portability. There is little justification for the current practice (which the present findings show still to be operative) of selecting augmentative systems merely according to the 2 or 3 broad criteria delineated above, namely general physical status, cognitive level and nature of school placement. This trend cannot be justified on the basis of current research evidence since the relationship between cognitive abilities and acquisition of Blissymbols is simply not known (see Chapter 12). Moreover, there are at least 3 studies which have used Blissymbolics with severely/profoundly mentally handicapped children (Elder and Bergman, 1978; Galloway, 1978; Harris-Vanderheiden, Brown, MacKenzie, Reinen and Scheibel, 1975). While these studies were limited in terms of duration, and in terms of the descriptions they provide of the children's ability levels, they do suggest that at least some low cognitive ability children can learn to acquire and use at least some Blissymbols. More information is clearly needed on the relationship between cognitive level and progress in augmentative system use, and on the role of intelligence in predicting sign and symbol acquisition. Data relating to these questions are to be presented in later chapters.

22.2 Intercorrelations Among the Cognitive and Perceptual Measures

Intercorrelations among the CMMS Interlevel Scale, Raven's CPM (Set A), the Frostig subtests, and Pre-symbol Assessment, were computed for the total sample, and for each of the Bliss and BSL (Makaton) groups separately (see Table 10). Examination of the data on scattergrams revealed that the relationships among the measures were mostly non-linear. Therefore, Kendall rank-order correlations, rather than Pearson correlations, were used.

Table 10: Intercorrelations Among the Cognitive and Perceptual Measures

i) The Total Group (n = 40):

	Raven's CPM	Frostig-Form Perception	Frostig-Position in Space	Pre-symbol Assessment
CMMS	0.60**	0.44**	0.54**	0.59**
Raven's CPM		0.47**	0.44**	0.51**
Form Perception			0.40**	0.55**
Position in Space				0.49**

ii) The Bliss Users Group (n = 20):

	Raven's CPM	Frostig-Form Perception	Frostig-Position in Space	Pre-symbol Assessment
CMMS	0.48*	0.43*	0.48*	0.56**
Raven's CPM		0.61**	0.07	0.42*
Form Perception			0.27	0.61**
Position in Space				0.35*

iii) The BSL (Makaton) Group (n = 20):

	Raven's CPM	Frostig-Form Perception	Frostig-Position in Space	Pre-symbol Assessment
CMMS	0.57**	0.25	0.46*	0.50*
Raven's CPM		0.18	0.66**	0.42*
Form Perception			0.36*	0.36*
Position in Space				0.55**

In each case, there was a significant relationship between performance on the Columbia MMS and the Raven's CPM, a reassuring finding since both are deemed to be measures of general reasoning ability, and both involve visual-perceptual tasks and apprehension of figural similarities. Nicholson (1970), too, found a significant (although somewhat higher) correlation (in the 0.70s) between these 2 measures, using slightly older cerebral palsied children. Over the total sample, both measures were also found to correlate significantly with the 2 Frostig DTVP subtests that were used, and with the Pre-symbol Assessment, undoubtedly because all have in common a strong dependence on visuo-spatial skills. It is further worth noting the significant, if modest, correlations that were found between the 2 Frostig subtests (Form Perception and Position in Space) in the total sample and in the BSL (Makaton) group. This finding runs counter to Frostig's (1966) claims for orthogonality of the DTVP subtests, and is in line with the large number of studies which have reported varying degrees of overlap between the subtests in groups of normal and mentally handicapped children.

Turning to consider the intercorrelations among the cognitive and perceptual measures in each of the Bliss and BSL (Makaton) groups separately, it can be seen that the relationships between the CMMS and Raven's CPM, and between the Pre-symbol Assessment and all other measures, remained significant (see Table 10). However, the patterns of intercorrelations between the cognitive measures and the 2 Frostig subtests were quite different. In the Bliss Users group, the cognitive measures correlated significantly with the Form Perception subtest, but the Raven's CPM did not correlate with the Position in Space subtest. In the Makaton Signing group the opposite pattern was found - the cognitive measures correlated significantly with the Position in Space subtest, but not with the Form Perception subtest. There is no ready explanation for these findings, which may be due to chance, or may indeed reflect the differential impact of degree of physical handicap on the relationship between the Frostig subtests and cognitive level in a way that is not immediately apparent. However, it must be said that even when the correlations between the cognitive measures and the 2 Frostig subtests were re-run while adjusting for the effects of severity of handicap, the patterns of intercorrelations remained identical to the above. Examining the scattergrams of the relationships between these variables in the Bliss and BSL (Makaton) groups, it appeared that in each case there were 1 or at most 2 subjects with an extreme score on only 1 variable, which may have been distorting the relationships. Kendall correlations between the cognitive measures and the Frostig subtests were re-run after excluding these subjects, yielding somewhat higher and (in all but 1 case) significant correlations between these measures in each group. In the Bliss group, the correlation coefficient between the Position in Space subtest and the Raven's CPM rose from 0.07 to 0.33 ($\underline{P}$ = .044) after excluding just 2 subjects with extreme scores; while in the BSL (Makaton) group, the correlation coefficient between the Form Perception subtest and the

Columbia MMS rose from 0.25 to 0.33 ($\underline{P}$ = .037), after excluding 1 subject with an extreme score. The correlation between the Form Perception subtest and the Raven's CPM in this group rose from 0.18 to 0.29, but remained nonsignificant.

The Pre-symbol Assessment is a short test developed by the Blissymbolics Communication Resource Centre (U.K.) (Davies, 1980) to assess children's performance on symbol matching and symbol identification tasks. There are no reported data on the test, but the present findings of significant, if modest, relationships between this measure and the other perceptual and cognitive tests that were administered, suggest that the measure may be of some value as a quick screening test, tapping cognitive and/or perceptual skills. The relationship between the Pre-symbol Assessment and acquisition and use of Blissymbols and Makaton Vocabulary signs will be examined in a later chapter.

22.3 The Relationship Between Intelligence and Severity of Physical Handicap

Most epidemiological investigations of cerebral palsy have reported a tendency for severe physical handicap and severe mental handicap to occur together. Asher and Schonell (1950) graded all their subjects according to severity of physical handicap, and found that those subjects with 'slight' handicap had a mean IQ of 81.8; those with 'moderate' handicap had a mean IQ of 71.7, while the severely handicapped had a mean IQ of 55.6. Dunsdon (1952), and Rutter, Graham and Yule (1970), also found that more cerebral palsied children with extensive physical handicaps had low intelligence quotients, when compared with children with less extensive physical disorders. In Dunsdon's study, approximately 70% of those children with all 4 limbs involved had IQs below 70, while only 38% of paraplegic children and 29% of hemiplegic children had IQs below 70. And Cockburn (1961) found that spastic tetraplegics, who are the most extensively physically handicapped among the spastics, tend to be of lower intelligence than any other sub-group of cerebral palsy. Such findings may be accounted for, at least in part, by reference to the brain damage underlying the motor handicaps. In addition, these findings accord well with the theories of cognitive development which emphasize the role of motor skills, and active participation in the environment, in influencing the development of intellectual skills. Central to such theories is the thesis that early motor development is one of the foundations upon which intellectual development is built. Thus, Piaget (1964) suggested that a child's development of cognitive skills passes through a well-defined sequence of stages, and that self-initiated actions and experiences form the basis of mental growth. In this process the child is seen as first co-ordinating his actions, then mental representations of these actions, and then sequences of mental operations. Where motor handicaps exist, then such theories predict that cognitive growth will be restricted (Rostron and Sewell, 1983).

However, there are severely physically handicapped individuals who are cognitively very capable. As Rostron and Sewell point out, the presence of such individuals must raise questions about the contention that motor activity is essential for cognitive growth. A major complicating factor in the cerebral palsy studies referred to above concerns the difficulty of determining the intelligence level of severely physically handicapped individuals. The IQ scores reported in these studies were typically based on tests which require motor and/or verbal performance (eg. the Stanford-Binet and the Wechsler Intelligence Scale for Children) and which are therefore not appropriate for cerebral palsied samples. Severely physically handicapped individuals are heavily penalized on such tests, achieving poor scores, and it is possible that this may have contributed to the finding of a close association between severity of physical and mental handicap. In other words, the close relationship reported in past studies between these 2 variables may have arisen as an artifact of the method of testing intelligence. The question of the relationship between severity of physical handicap and intelligence level needs to be re-examined, using cognitive measures which are not dependent on motor or verbal skills. The Columbia MMS, which was used in the present study, fulfils this requirement since performance on this test involves simple hand or eye pointing responses to multiple-choice problems. The relationship between this measure and measures of physical handicap was explored using Kendall correlation procedures, and the resulting correlation coefficients for the total sample, and for each of the Bliss and BSL (Makaton) groups, are presented in Table 11.1.

Over the total sample, no significant correlations emerged between the CMMS Interlevel Scores and measures of physical and motor status. Table 11.2 shows the distribution of IQ scores in the cerebral palsy sub-types for the total sample, and again there was no association between intelligence and extent of physical handicap, in this case expressed in terms of cerebral palsy diagnosis ($\chi^2 = 14.93$, d.f. $= 20$). Certainly, it must be borne in mind that the present sample comprised a carefully selected sub-group of the cerebral palsied population,

Table 11.1: Correlations Between Columbia MMS Interlevel Scores and Measures of Physical and Motor Status

	Total Sample (n = 40)	Bliss Users (n = 20)	BSL (Makaton) Users (n = 20)
Physical and motor status	tau	tau	tau
Severity of handicap rating	0.12	0.07	-0.49*
Head control	-0.06	0.14	0.47*
Locomotion	-0.10	0.11	0.50*
Sitting	-0.16	0.02	0.33*
Standing	-0.05	0.30	0.33*
P-A-C Mobility Scale	-0.16	-0.05	0.41*
P-A-C Agility Scale	-0.14	-0.13	0.44*
Hearing impairment	0.08	-0.21	0.29
Visual impairment	-0.04	-0.22	0.12
Fits since age 2 weeks	-0.03	-0.05	0.07
Fits in past year	0.06	-0.12	0.28

Table 11.2: Columbia IQ Scores in Cerebral Palsy Sub-groups - The Total Sample (n = 40)

	55 or below	56-69	70-89	90-109	110 or above
	n	n	n	n	n
Spastic hemiplegia	3	2	2	0	0
Spastic diplegia	4	3	1	1	0
Spastic quadriplegia	3	1	3	2	0
Athetosis	3	1	1	2	0
Mixed	0	1	1	0	0
Other	2	0	2	1	1

consisting only of moderately to severely physically handicapped children with minimal or no spoken language, who were being exposed to augmentative communication training. Thus, less severely physically handicapped hemiplegic and diplegic children with higher IQs were not represented in the sample, since such children tend to have better spoken language skills (Ingram, 1975). Children with profound mental and physical handicaps were also not likely to have been included, since few such children tend to be given any kind of augmentative communication training in schools (Kiernan, Reid and Jones, 1982). Therefore, no conclusions can be drawn from the present findings about a lack of association between physical and mental handicap in the cerebral palsy population as a whole. At best, it may be concluded that there is no such association within the group of nonspeaking cerebral palsied children. It is known that in the cerebral palsied population there are some children (particularly athetoids, but also some quadriplegics) who are very severely physically handicapped, but are also of relatively high cognitive abilities. When tested on cognitive measures requiring motor or verbal skills, as in past studies, these children would be likely to perform poorly. However, as is shown in the present study, when they are assessed on nonverbal and non-motor intelligence tests, such children are not penalized, and the previously found relationship between physical and mental handicap does not hold. A similar picture was found when examining the correlations in the Bliss Users group alone. This group had a number of severely physically handicapped athetoid and quadriplegic children with IQs above 70. On the other hand, in the BSL (Makaton) group, the correlations between the Columbia Interlevel Scale and measures of severity of handicap, postural control and P-A-C Mobility and Agility Scales were found to be significant. In this group there were no athetoid cases. More significantly, on examining the distributions of scores in this group, 2 to 3 children were found to have extreme scores (i.e. extreme low scores on both the Columbia MMS and the particular measures of physical status, or extreme high scores) which appeared to pull the correlations between IQ and the measures of physical skills to significance. After excluding these children from the analyses, the correlation coefficients with the Columbia MMS in the BSL (Makaton) group dropped to -0.41 for the severity of handicap measure, 0.00 for head control, 0.08 for locomotion, 0.23 for sitting, 0.31 for standing, 0.30 for the P-A-C Mobility Scale, and 0.39 for the P-A-C Agility Scale. All these correlations were nonsignificant, with the exception of the relationships with severity of handicap and the P-A-C Agility Scale, which remained significant at the .024 and .019 levels respectively.

The findings described above fail to support the contention that motor activity is essential for cognitive growth. In this regard, Rostron and Sewell (1983) propose that it is not motor movement per se that contributes to cognitive development, but the opportunity motor movement normally provides to link actions with consequences, to make sense of and construct internal models of the world. They argue that the primary function of motor activity is to provide a child with control of the environment, and feedback concerning the consequences of action is important for learning. However, it is possible to make sense of the world using other skills. It may thus be that those severely physically handicapped individuals who are not cognitively impaired have achieved some consistent control over the environment in other ways.

Chapter 23. Comparisons with Findings from Epidemiological Investigations

Past studies found that one-half to two-thirds of cerebral palsied individuals have severe communication difficulties, and that approximately 20% of cases have no intelligible speech (eg. Cockburn, 1961; Ingram, 1964; Rutter, Graham and Yule, 1970). The children included in the present study, who were chosen because they had minimal or no functional speech, and furthermore because they were being exposed to augmentative communication training, thus constitute a highly selected group within the population of cerebral palsied children. Despite this, the present findings agree very closely with the epidemiological studies of Dunsdon (1952), Ingram (1964), Rutter, Graham and Yule (1970) and others, in showing a slight preponderance of males to females (52.5% males). One of the most recent epidemiological surveys, carried out by Stanley (1979) in Western Australia, in fact found a male : female ratio of around 1 for the years 1971 - 1975. The finding that 35% of the present sample had had 1 or more epileptic fits, not counting those with convulsions in the first 2 weeks of life, is also in broad agreement with earlier reports; Rutter et al. found that 40% of their sample were epileptic, while Ingram's (1964) and Mitchell's (1961) figures were 32% and 25% respectively. Studies which undertook systematic investigation of hearing in cerebral palsied groups, have reported a prevalence of hearing defects of approximately 23% (Fisch, 1957; Henderson, 1961). In the present study only 7.5% of the sample were found to have some degree of hearing impairment. However, this information was obtained from the children's medical records, and the figure of 7.5% may thus be an underestimate, due to incompleteness of the records and/or inadequate investigations. This may also account for the relatively low prevalence of visual impairment (5%) in the present group, when compared with the figures reported by Douglas (1961) and Woods (1957) (14.4% and 18.3% respectively). The percentages of children found to have strabismus (25%) and nystagmus (5%), too, are considerably lower than the figures reported by Douglas (1961) (approximately 50% and 13% respectively).

In contrast to the above, a much higher percentage of the present sample was classed as being severely to very severely physically handicapped (62.5%), when compared with the findings of epidemiological surveys. Rutter et al.'s figure (using the same rating scale applied in this study) was 37%, and Schonell's (1956) 31%. However, given the general conclusion reached in previous studies (eg. Ingram, 1964) that the nonverbal and severely language impaired subgroup of the cerebral palsied population tends to be the most physically handicapped, this finding is only to be expected.

Table 12.1 presents the distribution of IQ scores in children with cerebral palsy in the present study, as compared with the distributions reported in some of the major epidemiological investigations conducted

Table 12.1: IQ Distribution of Children with Cerebral Palsy

	Asher & Schonell (1950) %	Dunsdon (1952) %	Cockburn (1961) %	Rutter et al. (1970) %	The Present Study %
110 or above	4		10		2.5
90 - 109	20	41	16	45	15
70 - 89	27		25		25
50/55 - 69	23	24	21	18	20
Below 50/55	22	35	28	36	37.5

to date. Over the total sample, the present findings agree very closely with these other investigations (particularly those of Rutter et al. (1970) and Dunsdon (1952)), in showing that just over one-third of the sample had IQs below 50 or 55, one-fifth had mild mental handicap, and just under half were not mentally handicapped. These findings may be considered as somewhat surprising. Given the general claim in past studies of a close association between severity of physical handicap and severity of mental handicap, it may have been expected that the present sample, selected for severity of speech impairment, and found to be more physically handicapped overall than the general population of cerebral palsied children, would have emerged as more mentally handicapped as well. In fact, as was discussed in Chapter 22, the present writer found no association between intelligence and severity of physical handicap in the total sample, which was explained in terms of the presence of some children (particularly athetoid and also quadriplegic cases) who were very severely physically handicapped but also had relatively high cognitive abilities. Thus, at least a partial explanation for the present IQ results is likely to be found in the overrepresentation of athetoid cases in the present sample (17.5% compared with Rutter et al.'s (1970) 2.9%), in that athetoids tend to show a very high frequency of speech defects and to be very severely physically handicapped, but also to be more intellectually able than children in other categories of cerebral palsy. Another factor to bear in mind in this regard is that many of the epidemiological studies used tests requiring motor and/or verbal skills to assess intelligence. Such tests are likely to penalize the severely physically handicapped and nonverbal cerebral palsied child, thereby - in some cases - yielding underestimates of IQs. This might certainly account for the finding that 55% of spastic quadriplegics in the present study obtained IQs above 70 (on a non-motor and nonverbal intelligence test), whereas past studies tended to find that all, or almost all, children with spastic quadriplegia were mentally handicapped (eg. Ingram, 1964; Rutter et al, 1970). It is, however, also possible that some of the quadriplegic cases in the present sample would have been more correctly classified as spastic diplegics, as has been suggested by Hagberg, Hagberg and Olow (1975). The present study's reliance on the children's medical casenotes for information on diagnosis means that this question must be left open. A final point to note regarding the present findings on IQ is that the sample comprised only nonverbal cerebral palsied children who were being taught to communicate with augmentative systems. There are no doubt many severely multiply handicapped non-speakers who are so profoundly mentally handicapped that they are not even considered for augmentative communication training, because schools feel they would make no headway with the systems. Such children would have been included in the wide-ranging epidemiological surveys referred to above, but are not represented in the present sample.

Turning to consider the distribution of cerebral palsy according to type, Table 12.2 shows the comparison between the figures found in this study and frequencies reported in some of the major epidemiological surveys of cerebral palsy. Given the fact that the children comprising

Table 12.2: Distribution of Cerebral Palsy Sub - types

	Asher & Schonell (1950) %	Henderson (1961) %	Rutter et al. (1970) %	Hagberg et al. (1975) %	The Present Study %
Hemiplegia	29	37.1	37.1	41	17.5
Diplegia	32	22.0	34.2	26	22.5
Quadriplegia	22	19.2	22.9	5	22.5
Dyskinesia	10	7.5	2.9	3	17.5
Ataxia	1	1.7	2.9	12	-
Mixed	5	9.6	-	4	5.0
Other	1	2.9	-	8	15.0

the present sample are not representative of cerebral palsied children in general, but rather of the nonverbal and more severely handicapped cerebral palsied group, the differences that emerge are largely as anticipated. Athetoid cases were overrepresented here (17.5% compared with Rutter et al.'s 2.9% and Hagberg et al.'s 3%), which is not surprising in view of previous findings that athetoids tend to show a very high frequency of speech defects (Ingram, 1975; Woods, 1957). Spastic quadriplegics comprised 22.5% of the sample, which is almost identical to Rutter et al.'s general prevalence figure, but is considerably higher than Hagberg et al.'s figure of 5%. (Hagberg et al.'s low figure results from their definition of this category, which excluded cases that would certainly have been included here by other investigators). Again, speech defects or inability to speak are frequently found in this group; dysarthria is invariably present, and since many cases are severely mentally handicapped, associated speech retardation is common (Asher and Schonell, 1950; Ingram, 1964). By contrast, spastic hemiplegics were underrepresented in the total group of subjects (17.5% compared with the 37% and 41% found by Rutter et al. and Hagberg et al.); but this is to be expected since severe speech impairment is far less common in this type of cerebral palsy. The percentages of spastic diplegic and mixed cases that were found, and the absence of ataxic cases, are largely in agreement with the findings of other studies. However, the diagnostic category of 'other' was overrepresented. In this regard it must be remembered that in the present study the diagnoses were all obtained from the children's medical casenotes. A number of these diagnoses had been made when the children were very young, and had not been updated. As pointed out by Hall (1984), the movement problems exhibited by the young cerebral palsied child are often hard to classify into the traditional categories of cerebral palsy. These children had thus been placed in the 'other' category in infancy, and the diagnoses had not been re-examined since that time.

Chapter 24. School Placement and the Teaching of Augmentative Communication Systems

General findings on school placement and the teaching of Blissymbolics and Makaton Signing are presented in this chapter, in order to provide a framework within which the children's linguistic abilities and acquisition of symbols and signs can then be described.

The 40 children were attending a total of 21 different schools, comprising 7 ESN(S) Schools, 1 ESN(M) School, 9 PH Schools, 3 Hospital Schools, and 1 PH Unit in an ordinary school. Overall, there were 9 different schools with 1 child in each school, 7 schools with 2 children in each, 3 schools with 3 children in each, and 2 schools with 4 children. The types of schools attended by the Bliss Users and BSL (Makaton) Users were described in Chapter 22.1, where it was shown that the 2 groups differed significantly in school placement ($\chi^2 = 22.62$, $\underline{d.f.} = 4$, $\underline{P} < .001$), with 70% of the Makaton Signers attending ESN(S)/(M) Schools, and 75% of the Bliss Users attending PH Schools or Units (see Table 9.3). Of the total group of children, 36 were day pupils, and 4 children (3 Bliss Users and 1 BSL (Makaton) User) were boarders, returning home at weekends and during the school holidays.

Each of the Bliss and BSL (Makaton) groups had had speech therapy training for an average of 15 months prior to entry into the symbol or sign programmes (for the Bliss group <u>S.D.</u> = 11.86, <u>range</u> 0 - 44 months; for the BSL (Makaton) group <u>S.D.</u> = 11.09, <u>range</u> 0 - 36 months). In all cases, the failure of traditional speech therapy training to result in a functional (spoken) communication system for the child led to the decision by speech therapists or teachers to introduce augmentative communication training.

In order to explore this decision making process in more detail, the speech therapists and teachers were asked to select the 4 most relevant reasons, out of a list of 17 possible criteria, for introducing the children to augmentative communication systems. Table 13.1 shows the numbers of teachers checking each item. In both the Bliss and Makaton groups, the commonest reasons cited were the absence of expressive language (noted by 60% of Bliss teachers and 90% of BSL (Makaton) teachers), and the possibility that the child would not achieve intelligible speech (cited by 85% of Bliss teachers and 40% of BSL (Makaton) teachers). The child's motivation to communicate was also a popular criterion, indicated by 65% of Bliss teachers and 45% of BSL (Makaton) teachers. These 3 primary reasons aside, the Bliss and Makaton teachers produced rather different distributions of additional criteria for placing the children in augmentative communication training programmes. Other common reasons cited by the Bliss teachers were the <u>presence</u> of good receptive language ability (55%), the success of the system with other children (40%), and the child's average to high level of intelligence (35%). In contrast, the BSL (Makaton) teachers indicated the <u>absence</u> of receptive language ability (45%),

Table 13.1: Reasons for Introducing the Children to Augmentative Communication Systems

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Age	0	0	2	10
Failure in other programmes	2	10	2	10
Presence of receptive language skills	11	55	4	20
Absence of receptive language skills	0	0	9	45
Absence of expressive language skills	12	60	18	90
Possibility that child would not achieve intelligible speech	17	85	8	40
Desire to communicate	13	65	9	45
Motor imitation ability	0	0	6	30
Ability to point to symbols/ execute signs	4	20	6	30
Ability to learn new tasks	0	0	1	5
Child easy to teach	0	0	0	0
Level of intelligence (average to high)	7	35	2	10
Other children at school use the system	1	5	2	10
Parents' enthusiasm for the system	2	10	2	10
System is easy for staff to learn	1	5	1	5
System is easy for child to learn	2	10	1	5
System was successful with other children	8	40	4	20

the child's imitation ability (30%), and the child's motor ability to produce signs (30%). Further criteria, which were cited by only 1 or 2 teachers in each group, included age, failure in other language programmes, the ability to learn new tasks, ease of learning the system for the child and teachers, and parents' enthusiasm for the system.

In sum, the purely pragmatic consideration of absence of expressive language was the most popular selection criterion cited by both Bliss and Makaton teachers, followed closely by the child's motivation to communicate. Good cognitive and language comprehension skills followed in popularity for the Bliss teachers, while poor receptive language skills and the physical ability to execute signs were rated more commonly by the BSL (Makaton) teachers. Kiernan, Reid and Jones (1982) found an almost identical pattern of responses to their questionnaire item asking schools on what basis children were chosen for sign and symbol programmes. As Kiernan et al.point out, these data would seem to indicate that Blissymbolics and Makaton Signing are perceived rather differently by teachers/speech therapists. Bliss appears to be seen primarily as a channel of expressive communication, and as requiring good cognitive and receptive language abilities from the child (i.e. as rather difficult to learn), but not as contributing more broadly to the child's intellectual and educational development. In contrast, Makaton Signing is more often seen as less demanding and easier to learn, and thus as appropriate for children who have both receptive and expressive difficulties with speech, provided that they have the requisite skills to imitate motor movements and execute signs.

Further confirmation for this conclusion comes from examination of the reasons given by the speech therapists or teachers for placing children in Bliss or Makaton programmes, rather than introducing them to any of the other augmentative systems that are available for use. As can be seen in Table 13.2, all the Bliss teachers cited the child's poor hand control as a reason for not selecting a sign system, and 30% to 35% of teachers also mentioned the child's good cognitive abilities, and the greater complexity and flexibility of Blissymbolics, as reasons for selecting this system. In contrast, 65% of Makaton teachers saw Makaton as more appropriate for low cognitive ability children;

Table 13.2: Reasons for Choosing Blissymbolics/Makaton Signing In Preference to Other Augmentative Systems of Communication

i) The Bliss Group (n = 20):

	n	%
Poor hand control	20	100
Average-high level of cognitive ability	7	35
Flexibility of system and potential for complexity	6	30
Easier to learn than traditional orthography	5	25
Can be understood by people unfamiliar with system	4	20
Other children use the system at school	2	10

ii) The BSL (Makaton) Group (n = 20):

	n	%
Low cognitive level	13	65
Easier to learn than other systems (including PGSS)	7	35
Easier to produce motorically than PGSS	4	20
Immediate and portable	12	60
Familiar to school staff	12	60
System augments speech	3	15
Child uses natural gestures	3	15
Child has visual impairment	1	5

35% stated that the system was cognitively easier for children to learn than other systems (including the PGSS), while 20% of teachers saw BSL

(Makaton) signs as easier to produce motorically than PGSS signs. Other reasons commonly cited for selecting this augmentative mode were the immediacy and portability of signing, which made it appropriate for ambulant children (60% of teachers), and the familiarity of school staff with the system (60%).

Overall, then, BSL (Makaton) tends to be seen as less cognitively demanding than Blissymbolics or other sign systems, and hence as more appropriate for lower-IQ children, provided that they have the requisite motor skills. On the other hand, Blissymbols is seen as a flexible and complex language system, more appropriate for intellectually able children who are non-ambulatory and have poor hand control. The teachers' responses accord with the earlier findings that the present sample of Bliss Users was more severely physically handicapped than the Makaton Signers, but also achieved significantly higher scores on non-verbal cognitive tests (see Chapter 22.1). And they provide further confirmation for the conclusion reached by the present writer, and by Kiernan, Reid and Jones (1982), that differential placement in Bliss and BSL (Makaton) programmes occurs primarily on the basis of 2 criteria-physical ability and cognitive level. In addition, teachers' familiarity with BSL (Makaton) signs appears to be a third important consideration for the selection of Makaton Signing.

At the commencement of the present study the Blissymbol Users had been learning Blissymbolics for a mean of 10.85 months (range 2 to 18 months), and their average age when first introduced to symbols was 5 years 1 month (range 3 years 6 months to 6 years 11 months). The BSL (Makaton) Users had been exposed to sign training for a mean of 10.40 months (range 1 to 18 months), and the mean age at which signs were introduced was 5 years 2 months (range 3 years 6 months to 8 years 10 months). There were no significant differences between the 2 groups on these variables (see Table 13.3). Thus, on average the children did not receive any exposure to augmentative systems of communication until they entered school at the age of approximately 5 years. In each of the Bliss and BSL (Makaton) groups there was only 1 child who had been started on an augmentative communication system before the age of 4 years. This tendency to defer the implementation of an augmentative approach until the child is of school age or even older (some children were aged 7 or 8 when signs or symbols were first introduced), and until the child has demonstrated often several years of failure in traditional speech therapy, indicates that augmentative approaches are still being regarded as a last resort (McDade, Simpson and Booth, 1980). This practice can

Table 13.3: Duration and Frequency of Blissymbol and Makaton Sign Training

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)		
	Mean	S.D.	Mean	S.D.	t
Length of time on signs/symbols prior to study (months)	10.85	5.56	10.40	5.56	0.26
Age at which sign/symbol training began (months)	61.40	14.76	61.45	20.18	0.01
Weekly sign/symbol teaching time (minutes per week)	108.75	52.19	82.75	33.42	1.88
Additional weekly speech therapy time (minutes per week)	25.50	25.39	11.25	15.80	2.13*

be explained in terms of the reluctance of parents, teachers and even speech therapists to introduce another system of communication until they are convinced that the child is making insufficient headway with speech. Such an approach is undesirable to say the least. There are numerous arguments for earlier implementation of a total communication approach. As McDade et al. point out, basic communication skills are important for social and emotional development, as well as constituting a critical interactive component to cognitive development in the early preschool years. Research has indicated that early language learning is critical for the normal acquisition of other developmental skills, so that the earlier augmentative communication training is introduced in the educational programming of communicatively handicapped and high risk infants, the more beneficial it is likely to be. In this way years of frustration with traditional speech therapy approaches may be avoided, and the establishment of immature and limiting communication patterns may possibly be prevented (Archer, 1977). Of the present sample, for example, some children had been in traditional speech therapy for up to 3½ years before augmentative communication was introduced. This argument is strengthened further by the absence of data indicating that the use of augmentative systems will inhibit speech development, and by the presence of many (mostly uncontrolled) studies claiming improved speech skills in at least some cases. The exploratory work of Le Prevost (1983) and McDade et al. (1980) in introducing signing to 1- and 2-year-old Downs' Syndrome infants is extremely promising in this regard.

Turning to consider the teaching input the children were receiving at the time of baseline assessment, Table 13.3 shows that the Bliss Users group was receiving more hours of augmentative communication training per week (a mean of 1 hour 49 minutes) than the Makaton Signing group (a mean of 1 hour 23 minutes). This difference was just short of statistical significance. The Bliss Users were also receiving significantly more speech therapy time devoted to other aspects of language development (a mean of 25.50 minutes per week) when compared with the Makaton Signers (a mean of 11.25 minutes per week). Furthermore, the type of additional training the 2 groups of children were receiving tended to be different ($\chi^2 = 8.97$, d.f. = 4, $P = .062$), with more of the Bliss Users receiving additional language comprehension work, and more of the BSL (Makaton) Users receiving additional speech articulation training (see Table 13.4). As the Bliss Users in the present study were found to be more able than the Makaton Users in terms of language comprehension, and the Makaton Users were more able in terms of speech expression (see Chapter 25), it would appear that speech therapists were inclined to concentrate on building up the children's areas of strength, but often at the expense of neglecting areas of weakness. Even more significant is the fact that 50% of the Bliss Users and 35% of the Makaton Signers were receiving no additional speech and language work, apart from the sign/symbol training sessions. While it may be argued, and with justification, that Blissymbol and BSL (Makaton) training incorporate general language development work, this was clearly not felt to be sufficient by the teachers and speech therapists of the 23 children who were receiving additional language sessions! It is open to question whether, for the other 17 children, signs/symbols were considered a replacement for speech, so that formal work on speech ceased, or alternatively whether the problem of time limitation in these cases did not allow for the inclusion of a separate programme for work on speech expression and comprehension, over and above the sessions devoted to augmentative communication training.

Table 13.4: Type of Additional Language Training Given

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
Additional training	n	%	n	%
Comprehension work only	8	40	1	5
Articulation work only	3	15	6	30
Comprehension and articulation work	1	5	3	15
Feeding work only	1	5	0	0
None	7	35	10	50

The increased teaching time afforded the Bliss Users group may well be due, at least in part, to the greater speech therapy input to PH schools, and the greater willingness of teachers and speech therapists to spend time working with children who are more able in terms of IQ and language comprehension. In this regard, it is interesting to note that while the Columbia MMS Interlevel Scores did not correlate significantly with weekly sign/symbol teaching time (for the Bliss group, tau = 0.12, P = .245; for the BSL (Makaton) group, tau = 0.11, P = .264), significant correlations were found between Columbia MMS Interlevel Scores and additional speech therapy time per week in the total sample (tau = 0.34, P = .002) and in the BSL (Makaton) group (tau = 0.30, P = .049). However, even the average of 1 hour 49 minutes weekly symbol teaching time which the Bliss Users were receiving, falls far short of the teaching input given in many of the published sign and symbol training studies, some of which claimed to give their subjects several hours of training per day, as well as continuous exposure to simultaneous communication throughout the school day (eg. Schaeffer, 1980a,b). Of the present sample, only 1 Makaton Signer was exposed to signing throughout the school day; and for a quarter of both the Bliss and BSL (Makaton) groups, their only exposure to signs/symbols occurred in the direct teaching sessions (see Table 13.5). There was no significant difference between the groups on this measure(χ^2 = 2.14, d.f. = 3). These figures are considerably lower than those quoted in the survey conducted by Kiernan, Reid and Jones (1982), where symbol systems were reported as being used throughout the school day in 61% of schools, and signing in 79% of ESN(S) Schools and 45% of PH Schools. However, as Kiernan et al.'s findings were based on postal questionnaires, they may well have overestimated the situation in practice.

Table 13.5: Extent of Use of Signs/Symbols at School

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Sign/symbol sessions only	5	25	5	25
Formal sessions + occasionally in class	15	75	13	65
All classwork	0	0	1	5
Throughout the school day	0	0	1	5

The above findings highlight one of the major advantages of conducting a naturalistic study such as the present one, in that information can be gathered on the extent to which signs and symbols are actually taught and used 'in the field'. A number of writers have pointed to the increasing number of special schools in the U.K. which have adopted augmentative communication systems in recent years (Kiernan, Reid and Jones, 1982; Remington and Light, 1983); but the present examination of the extent to which they use the systems reveals relatively low exposure to sign/symbol training, and considerable restriction on generality of use. On present evidence it seems likely that many special schools which claim to be using Blissymbolics and Makaton Signing, are in fact giving minimal attention to the systems. Past research studies on sign and symbol training have yielded highly positive outcomes for the majority of their subjects; but they have typically involved many hours of teaching in clinic settings, using skilled and enthusiastic trainers and clinicians. In view of such discrepancies with the present findings, it will be interesting to determine whether the follow up data gathered in the present study yield results as promising as those detailed in the research literature. For the moment, however, it can be stated that the lack of continuous exposure to signs/symbols is likely to limit the rate of sign/symbol acquisition and the level of use obtained. If children's potential for language mastery is to be fully exploited, they need to be involved in augmentative communication training and use for much longer than just one or two hours a week, and schools will be required to make a far greater investment in sign and symbol training.

The teachers or speech therapists having primary responsibility for implementing the Bliss or BSL (Makaton) training programmes, were asked to describe the strategies and techniques they used to teach the systems to their pupils. Their responses revealed many common procedures. Teaching strategies used with all the children included pairing the symbols and signs with tangible objects, pictures and verbal labels, labelling objects and pictures, discriminating between symbols or signs, and the use of praise and/or tangible rewards to reinforce performance on these tasks. Modeling and imitation were used by all the BSL (Makaton) teachers, while 65% of them also mentioned the use of physical prompting or moulding, which involves aiding the child to place his/her hands in the correct shape or body position for the sign, and moving the hands through the movements of the sign. Four of the Bliss teachers also described physically prompting the child to indicate symbols, while one teacher mentioned reliance on pictorial cues embedded in symbols, to facilitate symbol identification. Only 65% of the Bliss teachers and 20% of the BSL (Makaton) teachers described actively encouraging their pupils to produce multi-symbol/sign utterances in correct English word order, for example by using picture cards, by expanding upon and correcting the children's sign/symbol combinations, and, in the case of Bliss, by placing symbols on the communication chart following the pattern of the Fitzgerald Key (Fitzgerald, 1949). This procedure involves placing the symbols in columns according to their grammatical form, thereby providing a visual pattern for correct word order. The finding that so few BSL (Makaton) teachers actively worked on the production of sign combinations, may be due to the fact that most of the Makaton Users were of low cognitive ability and were only at the one-sign stage of language production.

When asked specifically about the use of English syntax, all the teachers said that they followed English word order when using signs or symbols, and that they expected those children who were at least at the two-sign/symbol utterance level to do the same. Only one school adopted a different policy to the above, teaching its three Bliss Users to use different styles of message transmission in different situations. These children were taught to use fully grammatical symbol utterances in formal teaching settings, but were shown how they could use telegraphic utterances to effect quicker message transmission in informal conversational settings. On further questioning it emerged that only 65% of BSL (Makaton) trainers and 15% of Bliss trainers consistently used signs/symbols, together with speech, when communicating with their pupils. A further 30% of Makaton teachers and 55% of Bliss teachers occasionally accompanied their speech with signs/symbols, while 1 Makaton teacher and 6 Bliss teachers only used speech when communicating with the children. Thus few of the children, particularly among the Bliss Users, had consistent models of system use, even among their own teachers.

It was also disappointing to find that only 5 Bliss teachers and 3 Makaton teachers mentioned the use of questioning strategies to elicit symbol/sign utterances from the children, and only 4 teachers in each group made conscious efforts to foster spontaneous use of the systems in formal settings, for example by introducing story telling or doll play tasks. Few teachers or speech therapists described the use of specific strategies to foster generalization of system use, for example by setting up opportunities for the child to communicate with a variety of people in different settings, or by creating situations where the child can express choice and exert control over events through messages conveyed manually or with symbols. Understandably, such strategies are often time-consuming, and they can be disruptive of classroom routine; but they are valuable in achieving generalization of sign or symbol use. Group teaching sessions are also important in this regard, since by its very definition, communication cannot take place in isolation. A major benefit of group sessions is that communication among children may be actively encouraged. However, only 50% of the Bliss Users and 45% of the Makaton Signers received any group teaching sessions; the remaining children were taught solely in individual sessions.

These findings reinforce the conclusion reached earlier in this chapter, that the present subjects were receiving relatively low exposure to fluent models of sign and symbol use at school, and that few attempts were being made by teachers and speech therapists to foster generalization of augmentative system use outside of formal training sessions.

A final question addressed to teachers on the issue of teaching strategies concerned the source of items for sign/symbol vocabularies, and the extent to which the BSL (Makaton) teachers adhered to the stages of the Makaton Vocabulary (Walker, 1976). In view of the absence of empirical evidence to support the necessity for adhering to the Makaton stages (Kiernan, Reid and Jones, 1982), and given that such adherence may indeed be undesirable in terms of the child's needs to develop communication in line with individual motivation, it was reassuring to find that only 3 of the present sample of BSL (Makaton) teachers reported following the Makaton Vocabulary stages rigidly. All the other BSL (Makaton) teachers (85%) used the Vocabulary flexibly, complementing or replacing Vocabulary items in the light of parents' and/or teachers' suggestions, and through observation of the child's behaviour, interests and needs. All 20 Bliss teachers also derived vocabulary items from analysis of school and home needs and from parents' and teachers' suggestions. One school also relied on a core vocabulary list developed at the school, in addition to home and school needs.

The children included in the present study had been introduced to sign or symbol training up to 1½ years prior to commencement of the study, and they were all obviously continuing to use the systems by the time of baseline assessment. In view of this, one additional aspect of background information that needs to be considered concerns the number of children in the schools who had been exposed to sign or symbol training at some time during this period, but with whom training had since been abandoned. In all, 4 children (in 3 PH Schools) had been introduced to Blissymbol training programmes but had been taken off the programmes after periods ranging from 6 months to 1 year because of lack of progress. For 2 of the children, lack of motivation to communicate was given as the reason for abandoning training, while the other 2 children were said to be unable to cope with the system because of low levels of cognitive ability. One of these children was then transferred to a BSL (Makaton) signing programme and had since succeeded in acquiring a few manual signs. In the signing schools, 8 children (from 3 ESN(S) schools) had been taken off Makaton Signing programmes after periods ranging from 4 months to 2 years of training, in one case because of the child's behaviour problems, in a second case because the child had motor coordination problems and was unable to imitate, and in the remaining cases because the children were said to have very low levels of ability and to have made no progress in sign acquisition. In view of the above, the children included in the present sample must, in one sense, be regarded as the 'successes' of augmentative communication training, in that they were considered by their teachers and/or speech therapists to have responded in a sufficiently positive manner to sign/symbol training, even at this early stage, to justify their continuing in the programmes.

Chapter 25. The Children's Performance on Language Expression and Comprehension Tests and Related Measures

25.1 Language Comprehension and Symbolic Play

The distributions of Reynell Comprehension Language Ages and English Picture Vocabulary Test (EPVT) standardized scores in the Bliss and BSL (Makaton) groups are presented in Tables 14.1 and 14.2. Because of floor and ceiling effects in the standardization data, comparisons between the 2 groups were worked out on the raw scores obtained on these tests. The Bliss Users group achieved significantly higher raw scores than the BSL (Makaton) group on both these measures, as well as on the Symbolic Play Test (SPT) and Bartak and Rutter's (1975) test of the Understanding of Natural Gestures (see Table 14.3). The higher scores of the Bliss group on the SPT are particularly interesting in view of this group's greater physical handicaps, when compared with the Makaton Signers. The reader is reminded that eye pointing responses were accepted on this test in lieu of physical manipulation of the toys, for those children who had minimal or no hand control. The present

Table 14.1: Distribution of Reynell Comprehension Language Ages

Language Age (in months)	Bliss Users (n = 20) n	%	BSL (Makaton) Users (n = 20) n	%
84 or above	1	5	0	0
72 - 83	1	5	0	0
60 - 71	2	10	0	0
48 - 59	3	15	0	0
36 - 47	11	55	5	25
24 - 35	2	10	11	55
13 - 23	0	0	4	20
12 or below	0	0	0	0

Table 14.2: Distribution of English Picture Vocabulary Test IQs

	Bliss Users (n = 20) n	%	BSL (Makaton) Users (n = 20) n	%
110 or above	0	0	0	0
90 - 109	6	30	1	5
70 - 89	6	30	4	20
64 - 69	0	0	1	5
63 or below	8	40	14	70

Table 14.3: Differences Between the Bliss and BSL (Makaton) Groups on Comprehension of Speech and Gestures, and Symbolic Play

Raw scores	Bliss Users (n = 20) Mean	S.D.	BSL (Makaton) Users (n = 20) Mean	S.D.	t
Reynell Comprehension Scale	46.55	9.56	29.50	11.11	5.20**
English Picture Vocab. Test	16.95	14.37	6.20	7.14	3.00*
Symbolic Play Test	21.20	4.40	16.90	5.95	2.60*
Gestural Comprehension	13.40	3.71	9.65	4.89	2.73*

writer found that those children who had good symbolic play skills were able to convey their intentions very clearly through eye pointing, so that symbolic intent could be reliably assessed. The above findings provide further confirmation for the statement that Blissymbolics tends to be considered most appropriate for children who are more able - in this case in terms of higher levels of language comprehension and inner language, and that schools seem to be excluding less competent children from Bliss programmes because they view the system as too complex for them (see Chapters 22.1 and 24).

Despite the sample's mean chronological age of 6 years 0 months, only 2 children (both Bliss Users) obtained Reynell Comprehension Language Ages of 6 years or above (see Table 14.1). The median Language Age for the Bliss group was between 3 and 4 years, and the median Language Age for the BSL (Makaton) group was between 2 and 3 years, thus demonstrating substantial receptive language impairment in the great majority of children. Relatively poor scores were also achieved on the receptive vocabulary measure (the EPVT), particularly in the case of the Makaton Users, with 75% of the Makaton Signers and 40% of the Bliss Users obtaining standardized scores of 69 or less. Low cognitive functioning may, in itself, be a sufficient cause for poor language comprehension, and in this regard it is important to remember that 70% of the BSL (Makaton) group and 45% of the Bliss group obtained Columbia MMS IQs of below 69. Furthermore, Kendall correlations between scores on the language comprehension measures and scores on the non-verbal cognitive tests that were used were found to be significant over the total sample, and most remained significant when the correlations were computed for each of the Bliss and BSL (Makaton) groups separately (see Table 14.4). Nevertheless, most of these correlations were modest, and in the BSL (Makaton) group the correlations between the Reynell Comprehension scores and the cognitive measures were, in fact, non-significant. In addition, it must be remembered that 55% of the Bliss group and 30% of the BSL (Makaton) group were <u>not</u> mentally handicapped. Thus, cognitive impairment cannot be held up as the <u>sole</u> explanation for the poor language comprehension scores obtained by the sample as a whole.

Other characteristics of the sample which undoubtedly had a role to play here are the children's expressive language handicaps and their physical and motor disabilities. The effects of developmental nonspeech conditions on language development as a whole are as yet little understood. However, a number of writers have raised the possibility that lack of productive experiences with language and lack of auditory-vocal feedback produce gaps in language development and understanding of language use (eg. Yoder and Kraat, 1983). In other words, it is possible that, at least in some cases, impaired language comprehension skills occur as a secondary consequence of the speech disorder. The question of the relationship between language comprehension and expressive skills

Table 14.4: Correlations Between the Language Comprehension and Symbolic Play Tests and the Cognitive and Physical Status Measures

i) The Total Sample (n = 40):

	Reynell Comprehension Scale	EPVT	Understanding of Gesture	Symbolic Play Test
Columbia MMS	0.46**	0.49**	0.59**	0.42**
Raven's CPM	0.50**	0.42**	0.46**	0.45**
Severity of Physical Handicap	0.41**	0.15	0.15	0.17

ii) The Bliss Users Group (n = 20):

	Reynell Comprehension Scale	EPVT	Understanding of Gesture	Symbolic Play Test
Columbia MMS	0.43**	0.53**	0.55**	0.25
Raven's CPM	0.58**	0.38	0.36*	0.41*
Severity of Physical Handicap	0.30	0.05	0.16	0.25

iii) The BSL (Makaton) Users Group (n = 20):

	Reynell Comprehension Scale	EPVT	Understanding of Gesture	Symbolic Play Test
Columbia MMS	0.26	0.29*	0.52**	0.31*
Raven's CPM	0.26	0.30*	0.40*	0.17
Severity of Physical Handicap	0.11	-0.21	-0.30	-0.12

in the present sample will be returned to in Chapter 25.3. Aside from the children's expressive language handicaps, their severe physical handicaps no doubt had an effect in limiting opportunities for interactive and communicative behaviours. All these factors may have played a part in affecting the children's language development. However, it is understandably extremely difficult to tease out the role of such factors. Moreover, the correlations between physical status and the language comprehension measures were almost all nonsignificant (see Table 14.4). The one significant correlation which did emerge over the total sample - between severity of physical handicap and Reynell Comprehension scores - was in fact a <u>positive</u> correlation. As was the case concerning the absence of significant correlations between nonverbal intelligence and severity of physical handicap, the present findings may be explained with reference to the unusually high number of severely handicapped high ability athetoids and spastic quadriplegics in the present sample. It can thus be concluded that while physical handicaps are likely to have deleterious effects on level of language comprehension in many cases, there are some cases of individuals who have good language comprehension skills despite severe physical handicaps.

In addition to the children's poor scores on the Reynell Comprehension Scale and EPVT, low levels of performance were also found on the Test of Comprehension of Gestures and the Symbolic Play Test. The only norms available for the Comprehension of Gestures Test are those provided by Bartak (1977) for autistic and dysphasic children. These 2 groups achieved mean scores of 10.88 and 15.05 respectively on this test, out of a total possible score of 16 points. The present Bliss group's mean score of 13.40 is thus rather lower than that of Bartak's dysphasic group, while the mean score of the BSL (Makaton) group (9.65) is slightly lower than that of Bartak's autistic sample. The results indicate that on average the Bliss Users were able to comprehend most, but not all, of the 16 commonly used gestures that were assessed, while the Makaton Signers understood on average only slightly more than half of these gestures. The relative deficits of the signing children on this measure are particularly striking in view of the fact that they were significantly less physically handicapped than the Bliss Users, and, moreover, that they had had the advantage of training in the use of manual signs for an average of 10 months prior to baseline assessment.

The modifications made in administering the Symbolic Play Test (using larger sized toys and accepting eye or hand pointing responses), and the fact that the test was standardized on much younger children (aged 1 to 3 years), meant that the age norms for this test were not applicable. However, for these very reasons, the children may have been expected to score at the ceiling of the test. In fact, the Bliss Users obtained a mean of 21 correct responses out of a total of 24 responses; and, again, despite the Makaton Signers' greater physical and motor skills, they obtained a significantly lower mean score - of only 17 correct responses (see Table 14.3).

The above findings thus indicate that, in terms of <u>average</u> performance, the present sample's linguistic deficits extended beyond the expression and comprehension of spoken language, into the areas of representational abilities and inner language. These children's poor symbolic play skills and gestural comprehension deficits are not difficult to understand when they are considered within the context of their severe physical, communicative and (in many cases) cognitive handicaps, since these handicaps inevitably limit the opportunities to interact with and manipulate the environment, and reduce the possibility for cooperative imaginative play. Piaget (1964), for example, argued that throughout the sensorimotor period motoric interaction and object manipulation are important for the development of symbolic representation and related cognitive skills. Interestingly, in the present sample the SPT and Understanding of Gesture scores correlated significantly with nonverbal IQ, but not with the severity of physical handicap rating (see Table 14.4). This finding accords well with Mogford's (1977) statement that intelligence level is likely to be more decisive for the development of play skills than physical disability, since physically handicapped children of normal intelligence are likely to be able to exercise great ingenuity in play expression. Again, the presence of a number of severely physically handicapped children with relatively high cognitive and representational skills, is likely to account for these findings. On the other hand, it must be remembered that over 60% of the present subjects were severely to totally physically handicapped. The absence of significant correlations between this measure and the SPT, and gestural ability, may therefore be due to the limited variability in the severity of physical handicap rating. The part played by the children's cognitive, physical and communicative handicaps in accounting for their deficits in symbolic play and the understanding of gestures is clearly difficult to tease out. At this point it can be concluded only that such deficits <u>are</u> found in this group of severely physically handicapped nonverbal children, but that, in addition, there are <u>some</u> children who, despite their physical and spoken language handicaps, have the capacity for symbolic representation.

The present writer is aware of no other formal studies of the symbolic play or gestural skills of nonverbal cerebral palsied children. However, anecdotal reports by Finnie (1968), Hewett (1970) and Shere and Kastenbaum (1966) support the present finding of severely limited development of play skills in such children, particularly in those who are also mentally handicapped. Further support can be found in a number of studies which have investigated the symbolic play of language disordered, autistic and mentally handicapped children (eg. Jeffree and McConkey, 1976; Lovell, Hoyle and Siddall, 1968; Rutter, Bartak and Newman, 1971; Udwin and Yule, 1983; Whittaker, 1980). These writers have all found impoverished representational skills in these groups of children when compared with normal children, as well as a significant negative relationship between extent of language handicap and the ability to engage in symbolic play. Writers such as Piaget (1967) and Sheridan (1969), too, have posited the view of a close relationship between symbolic play, gestural ability, and language development, and argued in support of the notion of a generalised symbolic function or some type of inner language as a shared basis for these functions. Findings on the relationship between symbolic play skills and language level in the present study will be discussed in Chapter 25.3.

In the light of the above discussion, and bearing in mind the significant differences between the Bliss and BSL (Makaton) groups in IQ and degree of physical handicap, the writer re-examined the differences between the 2 groups on the language comprehension and symbolic play measures using IQ and severity of handicap as covariates. The resulting analyses of covariance are presented in Table 14.5. As can be seen, the differences between the groups on these measures were no longer significant, indicating that the effects of the dependent variables were fully explained by the effects of the 2 covariates.

Table 14.5: Differences Between the Bliss and BSL (Makaton) Groups on Comprehension of Speech and Gesture, and Symbolic Play, with IQ and Severity of Handicap as Covariates

Main effects	F	P
Reynell Comprehension Scale	1.791	.189
English Picture Vocabulary Test	0.006	.938
Symbolic Play Test	0.038	.846
Understanding of Natural Gestures	0.562	.459

25.2 The Children's Expressive (Spoken) Language Status

One of the criteria for selecting the cerebral palsied children included in the present study was that they had no speech, or largely unintelligible speech, with no more than approximately 30 intelligible spoken words. Table 15.1 shows the distribution of the number of spoken words and degree of speech intelligibility (as rated by speech therapists) in each of the Bliss and BSL (Makaton) groups. As can be seen, 60% of the sample (80% of the children in the Blissymbolics training group and 40% of the children in the BSL (Makaton) training group) had 3 spoken words or less; 15% of the Bliss Users and 45% of the Makaton Signers had between 4 and 30 words; while 1 Bliss User and 3 Makaton Users had slightly over 30 spoken words. Of the 16 children (4 Bliss Users and 12 Signers) who had more than 3 spoken words, only 2

Table 15.1: Number of Spoken Words and Rating of Intelligibility of Speech

	Bliss Users (n = 20)		BSL (Makaton) Users (n 2= 20)	
	n	%	n	%
Number of spoken words				
More than 30	1	5	3	15
11 - 30	1	5	4	20
4 - 10	2	10	5	25
3 or less	16	80	8	40
Intelligibility of speech				
Intelligible speech	0	0	2	10
Difficulty with some sounds	1	5	4	20
Difficulty with most sounds	3	15	6	30
No spoken words	16	80	8	40

(both Makaton Signers) had 'difficulty with some spoken sounds', while the remaining 3 Bliss Users and 6 BSL (Makaton) Users had 'difficulty expressing most sounds'. More specific information on the children's sound production abilities is presented in Table 15.2, where it can be

Table 15.2: Sound Production Skills

	Bliss Users (n = 20) %			BSL (Makaton) Users (n = 20) %			
	Usually	Occ.	Never	Usually	Occ.	Never	χ^2
Throaty noises, grunts, moans	90	10	0	100	0	0	0.53
Open vowel sounds	75	15	10	75	25	0	2.50
'Mm' or 'ss' sounds	10	50	40	40	30	30	4.89
Consonant sounds	10	55	35	45	40	15	6.53*
Repeating same syllable	10	40	50	40	35	25	5.33
Combining 2 different sounds	5	20	75	35	20	45	6.00*
Babbling	0	20	80	45	5	50	12.19*

seen that the majority of children (particularly those in the Bliss group) had extremely limited ability to produce sounds other than open vowel sounds. The children's poor expressive language skills are further reflected in the distribution of Reynell Expressive Language Ages, with 85% of the children attaining language ages of below 2 years, and the other 15% achieving language ages of between 2 and 3 years (see Table 15.3).

Table 15.3: Distribution of Reynell Expressive Language Ages

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
Language Age (in months)	n	%	n	%
Above 36	0	0	0	0
30 - 36	0	0	1	5
24 - 29	2	10	3	15
18 - 23	2	10	3	15
13 - 17	1	5	6	30
12 or below	15	75	7	35

Examination of the children's mean scores on the tests of Verbal and Motor Imitation, and Expression of Natural Gestures, which are detailed in Table 15.4, reveals considerable deficits in these areas too.

Table 15.4: Verbal and Motor Imitation, and Expression of Natural Gestures

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)		
	Mean	S.D.	Mean	S.D.	*t*
Verbal imitation - total	1.90	3.75	4.95	5.00	2.18*
Verbal imitation - sounds	1.45	2.42	3.75	3.35	2.49*
Verbal imitation - words	0.45	1.57	1.20	1.91	1.36
Motor imitation - total	4.90	2.61	6.00	3.40	1.15
Motor imitation - arm movements	2.75	1.52	2.80	1.91	0.09
Motor imitation - hand and finger movements	2.15	1.50	3.20	1.77	2.03*
Expression of natural gestures	20.20	7.70	15.75	9.87	1.59

On average, the Bliss and BSL (Makaton) Users were able to imitate only 1.45 and 3.75 consonant sounds, respectively, out of the total of 12 sounds presented to them, and only 0.45 and 1.20 words, out of the 12 words presented to them. Similarly, on the Imitation of Gestures Test, the 2 groups achieved mean scores of 4.90 and 6.00 respectively, out of a possible total score of 16 points. Butler (1971) administered this test to 440 normal 4- and 5-year-old children in their first year at school. In her study, each of the 8 gestural imitation items could score only 1 point, whereas in the present study each item could score a maximum of 2 points. In view of these differences in scoring, direct comparisons with Butler's figures are not possible. In order to allow for a rough comparison, the scores reported by Butler were multiplied by 2, and the resulting distributions of total gestural imitation scores in her sample and the present sample are presented in Table 15.5.

Table 15.5: Distribution of Scores on the Imitation of Gestures Test in the Bliss and Makaton Groups, as Compared with Butler's (1971) Findings

	Bliss Users	BSL (Makaton) Users	Butler's Sample
	(n = 20)	(n = 20)	(n = 440)
Total score (max. 16)	%	%	%
15 - 16	0	5	36.8
13 - 14	0	0	24.8
11 - 12	0	0	19.5
0 - 10	100	95	18.9

The results clearly show the present sample's deficits in motor imitation, when compared with the performance of normal 5-year-old children. On the Test of Expression of Natural Gestures, the Bliss group achieved a mean score of 20.20, and the BSL (Makaton) group a mean score of 15.75, out of a total possible score of 32 points. The children were thus able to use gesture to describe the use of objects or to mime actions in response to only about half of the test items presented. There are no data on the use of this test with normal children. Comparing the present results with those cited by Bartak (1977) for autistic and dysphasic children, it was found that the present subjects achieved similar average scores to the dysphasic children (mean = 16.78), but higher scores than Bartak's autistic group (mean = 11.25).

The deficits in the present sample thus extend beyond the expression of spoken language into the areas of imitation and use of naturalistic gesture, both of which involve representational abilities. However, these tests are all performance tests, and it must be recognized that for physically handicapped children such as those included in the present study, success on these tasks is dependent not only on imitation and gestural skills per se, but also on physical and motor status. Such children may, for example, be able to make certain sounds or movements spontaneously, but may become stiff when consciously trying to produce a given sound or movement on request.

The Makaton group achieved significantly higher scores on the measures of verbal expression than the Bliss Users group. This is in direct contrast to the findings for language comprehension, where it was the Bliss Users group which attained higher scores. Here, the Makaton Signers achieved significantly higher raw scores than the Bliss Users on the Reynell Expression Scale ($\underline{t}$ = 2.08, $\underline{d.f.}$ = 38, $\underline{P}$ = .044), on the rating of degree of intelligibility of speech (χ^2 = 12.04, $\underline{d.f.}$ = 4, $\underline{P}$ = .017), on the total sound development score ($\underline{t}$ = 2.74, $\underline{d.f.}$ = 38, $\underline{P}$ = .009), and on the individual sound production items of consonants, sound combinations, and babbling (see Table 15.2). The differences between the 2 groups on the number of spoken words, the production of 'mm' or 'ss' sounds, and syllable repetition, were slightly short of significance (χ^2 = 6.75, $\underline{d.f.}$ = 3, $\underline{P}$ = .080); χ^2 = 4.89, $\underline{d.f.}$ = 2, $\underline{P}$ = .087; χ^2 = 5.33, $\underline{d.f.}$ = 2, $\underline{P}$ = .070). Thus the BSL (Makaton) group, although still severely impaired in spoken language, had more spoken language than the Bliss Users group. In addition, the Makaton Signers obtained a significantly higher mean total score on the Verbal Imitation Test, and higher scores on the tests of Imitation of Sounds and Imitation of Hand and Finger Movements (see Table 15.4). Interestingly, the 2 groups did not differ significantly on Imitation of Words, Imitation of Arm Movements, or the test of Expression of Natural Gestures. These findings, and the finding that the Bliss group achieved higher scores than the Makaton Signers on Comprehension of Natural Gestures, are particularly worthy of note, since they suggest that despite the signers' greater physical skills, and despite their prior exposure to BSL (Makaton) sign training, they were, at baseline testing, no more attuned to the gestural aspects of communication than were the Bliss Users. And, on the Comprehension of Gestures Test, they in fact performed more poorly than the Bliss Users. (A possible explanation for these findings will be discussed below). This again highlights the questionable practice of assigning children to signing programmes simply on the basis of their superior physical skills. As is clearly shown here, such gross matching of children to signing programmes on the basis of level of physical ability does <u>not</u> necessarily mean that these children have greater ability or potential to express themselves in gestures, or that a manual communication system - as opposed to a symbol system - is more appropriate for them.

The comparatively better performance of the Makaton Signers on most of the measures of verbal expression is likely to be related to the finding that this group was significantly less physically handicapped in general and, in particular, was rated by speech therapists as having significantly less impairment of the speech musculature and fewer feeding difficulties, when compared with the Bliss Users group (χ^2=11.26, $\underline{d.f.}$ = 3, $\underline{P}$ = .010; χ^2 = 13.69, $\underline{d.f.}$ = 3, $\underline{P}$ = .003).

Moreover, on testing, the Makaton group was found to display significantly better coordination of tongue movements than the Bliss Users, in terms of both side to side tongue movements and licking the top lip ($\chi^2 = 10.59$, d.f. = 2, P = .005; $\chi^2 = 7.38$, d.f. = 2, P = .025). As shown in Table 15.6, 85% of the Bliss group were rated as having severe or very severe impairment of the speech musculature, and 15% had moderate impairment; whereas of the signing group, only 40% had severe to very severe impairment, and 60% had moderate to no impairment of the oral musculature. Similarly, 75% of the Bliss Users but only 20% of the Makaton Signers had severe to very severe feeding difficulties, and 95% of the Bliss Users but only 50- 60% of the Signers displayed marked abnormalities on the test of tongue coordination. The neuromuscular status of the oral musculature is clearly one of the most important factors in the development of vocal language. Ferrier and Shane (1983) have argued that the use of the oral musculature for speech depends on its previous successful use for feeding; and Jones (1975) and Love, Hagerman and Taimi (1980) found that feeding problems caused by neuromuscular impairment were closely associated with poor speech development.

Table 15.6: Impairment of the Speech Musculature and Feeding Difficulties

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Impairment of the speech musculature				
None/slight	0	0	6	30
Moderate	3	15	6	30
Severe	14	70	5	25
Very severe	3	15	3	15
Side to side tongue movements				
Normal	1	5	4	20
Slight abnormality	0	0	6	30
Marked abnormality	19	95	10	50
Licking the top lip				
Normal	1	5	4	20
Slight abnormality	0	0	4	20
Marked abnormality	19	95	12	60
Feeding difficulties				
None/slight	0	0	5	25
Moderate	5	25	11	55
Severe	5	25	1	5
Very severe	10	50	3	15

The Bliss Users' greater deficits in expressive speech can thus probably be at least partly explained in terms of the greater incidence of severe speech musculature impairment and feeding difficulties in this group, when compared with the signing group. The question of the relationship between feeding difficulties, impairment of the speech muscles, and expressive language status in the present sample will be examined in greater detail in Chapter 25.4.

However, it is also clear from the figures presented in Table 15.6 that the present subjects' expressive language difficulties cannot be accounted for solely in terms of impairment of the oral musculature, since a significant number of children had only slight to moderate degrees of speech mechanism impairment, or no impairment. Other factors which may have played a part include hearing loss (in 1 case), mental handicap, and possibly also physical handicap in general (i.e. over and above impairment of the speech musculature). The present writer therefore now turns to examine the question of the relationship between the measures of expressive language and related skills, and levels of physical and mental handicap.

Table 15.7 shows the correlations between the measures of language expression and cognitive and physical level, for the total sample. The correlations between these measures in each of the Bliss and BSL (Makaton) groups are presented in Appendix 17. Over the total sample

Table 15.7: Correlations Between the Expressive Language and Imitation Measures and the Cognitive and Physical Handicap Measures - The Total Group (n = 40)

	Columbia Interlevel Score	Raven's CPM	Severity of Physical Handicap
	tau	tau	tau
No. of spoken words	0.02	-0.06	-0.41*
Intelligibility of speech	-0.05	0.05	-0.37*
Sound development - total score	0.00	-0.15	-0.33*
Reynell Expression - raw score	-0.02	-0.06	-0.36*
Verbal imitation - total score	-0.08	-0.08	-0.37*
Motor imitation - total score	0.25*	0.08	-0.28*
Expression of naturel gestures	0.40**	0.23*	-0.10

the measures of verbal expression and imitation correlated significantly, and negatively, with severity of physical handicap, but not with the

2 nonverbal cognitive measures (the Columbia Interlevel Scores and the Raven's CPM). In other words, the greater the children's physical handicaps, the poorer were their skills in spoken language and in verbal imitation. These results are as expected, and accord with the earlier finding that the Makaton Signing group achieved significantly higher scores on these measures when compared with the Bliss Users group, in that the former group was also significantly less physically handicapped than the latter group. Overall, these findings are in direct contrast to the findings for the language comprehension measures, which were found to correlate significantly with IQ but not with severity of physical handicap. Of course, the absence of significant correlations between the expressive language measures and intelligence cannot be taken to indicate that cognitive abilities are irrelevant to expressive language development. Rather, they suggest that in this severely speech impaired cerebral palsied sample, extent of physical handicap was more important than IQ as a determiner of level of expressive language. However, it must also be borne in mind that the Bliss group in the present sample contained a number of athetoid and quadriplegic children who were severely physically handicapped and non-verbal, but also had relatively high cognitive ability; the presence of these children may well account for the lack of association between verbal expression and cognitive level in the total sample, and in the Bliss group (see Appendix 17). In the BSL (Makaton) group, by contrast, there were no athetoid cases and, correspondingly, the correlations between language expression and cognitive level were somewhat higher, although only 2 of these reached significance (the correlations between number of spoken words, and development of sounds, and the Columbia MMS). The significant correlations between the language measures and severity of physical handicap, found over the total sample,did not hold up in the case of the Bliss and BSL (Makaton) groups separately. The reason for this is not entirely clear, but is perhaps best explained in terms of reduced variability in the measures within each of the 2 groups. The specific question of the relationship between impairment of the speech musculature and expressive language abilities will be explored further in Chapter 25.4.

There were, however, 2 measures which did not fit in with the picture described above, namely expression of natural gestures and motor imitation. With 2 exceptions, these measures correlated significantly with the cognitive measures, as well as with the severity of physical handicap rating, over the total sample. Not surprisingly, they also correlated with the Position in Space subtest of the Frostig Test of Visual Perception (tau = 0.44, P <.001; tau = 0.36, P = .002). As already noted, imitation and gestural expression skills involve representational ability and visual perception, as well as physical and motor skills. Examination of the correlations in each of the Bliss and BSL (Makaton) groups separately (see Appendix 17) showed that among the Bliss Users, who were on average more severely physically handicapped and more cognitively able than the Signers, performance on these tasks was more closely associated with the severity of handicap measure; whereas in the more physically able but lower IQ Signing group, it was only the relationship with cognitive level which emerged as significant. These different patterns of correlations may help to explain the findings, described earlier, of no significant difference between the 2 groups on the Tests of Expression of Natural Gestures and Motor Imitation (see Table 15.4). It may be argued that the strength of the Bliss Users in terms of cognitive ability compensated to some extent for their deficient physical skills, and that the greater physical skills of the Makaton Signers (and possibly also their prior training in signing) compensated to an extent for their relative cognitive deficits, thereby ultimately yielding similar levels of performance in the 2 groups on motor imitation and gestural expression.

A final point to note is that when the writer re-examined the verbal expression measures on which significant differences between the Bliss and Makaton groups were found, while controlling for IQ and severity of handicap, the differences between the 2 groups were no longer significant (see Table 15.8).

Table 15.8: Differences Between the Bliss and Makaton Groups on the Measures of Verbal Expression, with IQ and Severity of Handicap as Covariates

Main effects	F	P
Intelligibility of speech	1.028	.317
Sound development - total score	1.637	.209
Reynell Expression - raw score	0.578	.452
Verbal imitation - total score	0.406	.528
Verbal imitation sounds	0.675	.417
Motor imitation - hand & finger movements	1.149	.291

25.3 Intercorrelations Among the Measures of Language Comprehension and Expression

Table 16.1 presents the intercorrelations among the measures of language comprehension, speech expression, symbolic play, imitation and use of gesture, for the total sample. The results show significant correlations between the 2 language comprehension measures - the Reynell Comprehension Scale and the English Picture Vocabulary Test (assessing single word vocabulary recognition), and between these measures and the SPT and Comprehension of Gestures Test. These correlations were also significant in each of the Bliss and BSL (Makaton) groups separately (see Appendix 18), except that in the Makaton group the SPT was not significantly correlated with the 2 language comprehension measures, possibly because of the more limited range of SPT scores in this group. However, this result aside, the findings provide support for the importance of the capacity for symbolic representation for the acquisition of receptive knowledge of a language, in that the individual must be able to use something (not necessarily a word) to stand for something else (an object or concept). As such, the results agree with the work of such writers as Piaget (1967) and Sheridan (1969) on a close relationship between symbolic play, gestural ability and language development, and support the notion of a generalized symbolic representational function or some type of 'inner language' as a shared basis for these functions. (But see the results of the factor analysis below on the role of IQ). The findings are also in line with those of other researchers who have found a close relationship between language development and the ability to engage in symbolic play in such diverse groups as normal children (Lowe, 1975; Rosenblatt, 1977), mentally handicapped children (Lovell, Hoyle and Siddall, 1968; Whittaker, 1980), autistic children (Rutter, Bartak and Newman, 1971) and language disordered children (Reynell, 1973; Udwin and Yule, 1983). It is certainly interesting to find that this relationship held up even in the present group of physically handicapped children, some of whom had so little motor control that they could only indicate symbolic play intent by eye or hand pointing responses. Although the correlation coefficients between the SPT, and Comprehension of Gestures, and language comprehension were rather modest (ranging from 0.44 to 0.71), they suggest that with further refinement such measures of symbolic play and gestural understanding might provide useful information concerning the language comprehension potential of nonverbal and language impaired children, including those who are severely physically handicapped.

Table 16.1: Intercorrelations Among the Measures of Language Expression and Comprehension - The Total Sample (n = 40)

	EPVT	Gestural Comp.	SPT	No. spoken words	Speech intellig.	Sound dev.	Reynell Expres-sion	Verbal imit.	Sound imit.	Word imit.	Motor imit.	Arm imit.	Hand & finger imit.	Gestural Expression
Reynell Comprehension	0.69**	0.61**	0.48**	-0.08	-0.01	-0.14	-0.06	-0.16	-0.16	-0.12	0.00	0.17	-0.14	0.35**
EPVT		0.71**	0.44**	0.10	-0.17	-0.08	0.03	-0.08	-0.08	0.02	0.10	0.24*	0.05	0.41**
Gestural Comprehension			0.56**	0.11	0.22	0.00	0.06	-0.07	-0.07	0.07	0.24*	0.37**	0.09	0.48**
SPT				-0.21	0.16	-0.17	-0.18	-0.30*	-0.30*	-0.18	0.14	0.29*	0.00	0.29*
No. of spoken words					0.77**	0.67**	0.75**	0.69**	0.67**	0.77**	0.25*	0.14	0.27*	0.23*
Speech intelligibility						0.53**	0.59**	0.53**	0.50**	0.63**	0.21	0.12	0.23	0.30*
Sound development							0.53**	0.52**	0.52**	0.52**	0.12	0.04	0.17	0.14
Reynell Expression								0.69**	0.69**	0.59**	0.26*	0.19	0.23*	0.19*
Verbal imitation-tot.									0.97**	0.72**	0.15	0.11	0.12	0.03
Sound imitation										0.66**	0.15	0.11	0.12	0.03
Word imitation											0.18	0.13	0.15	0.10
Motor imitation-tot.												0.77**	0.80**	0.39**
Imitation arm move.													0.47**	0.42**
Imitation hand + finger														0.29*
Gestural expression														

Turning to consider the relationships among the measures of verbal expression, high intercorrelations (mostly in the 0.60s and 0.70s) were found over the total sample between the number of spoken words the children had, the degree of speech intelligibility, the total sound development score, the Reynell Expressive Language Scale and the test of Verbal Imitation. Again, all these correlations remained significant within each of the Bliss and BSL (Makaton) groups (see Appendix 18).

On the other hand, there were no significant correlations, over the total sample, between these measures of verbal expression and the measures of language comprehension and symbolic play. In other words, in this sample of physically handicapped and severely speech impaired children, the measures of expression and comprehension of speech were quite unrelated. These results run counter to past findings of high correlations between the Reynell Expression and Comprehension Scales in normal and language disordered children (eg. Silva, Bradshaw and Spears, 1981; Udwin, 1981), and between measures of verbal expression and symbolic play skills in normal, mentally handicapped and language disordered children (eg. Lovell et al., 1968; Nicolich, 1977; Udwin and Yule, 1983, Whittaker, 1980). The present findings can be accounted for by the presence in the sample of a number of severely physically handicapped athetoid and quadriplegic children who had relatively high cognitive ability and good comprehension and symbolic skills but who, due to their physical handicaps, had no expressive speech. The results thus suggest that in this sample of severely speech impaired and physically handicapped cerebral palsied children, lack of productive experiences with language, and lack of auditory-vocal feedback, are not on the whole associated with poverty of language comprehension. They further accord with the findings described earlier (see Chapters 25.1 and 25.2) of significant correlations over the total sample between the measures of language comprehension and IQ (but not physical handicap), and between the measures of language expression and severity of physical handicap (but not IQ), while the relationships between the cognitive measures and severity of physical handicap were not significant over the total sample.

In the Bliss Users group, too, there were no significant correlations between the measures of speech expression and comprehension (see Appendix 18), while the correlations between the SPT and the expressive language measures of sound development and verbal imitation were significant but in a <u>negative</u> direction. In contrast, examination of these relationships in the BSL (Makaton) group shows significant and positive (if modest) correlations between the comprehension measures and the measures of verbal expression. In this regard, it is important to point out that most of the high ability nonverbal children in the present sample were in the Bliss Users group. The BSL (Makaton) group had no athetoid children, and on the whole the Signers had fewer severe physical handicaps and more spoken language than the Bliss Users. In other words, in this group the relationship between speech expression and comprehension was not confounded by the presence of severely physically handicapped children who were nonverbal but with relatively high levels of cognitive ability and language comprehension skills.

Turning to consider the Motor Imitation Test, over the total sample and in each of the Bliss and BSL (Makaton) groups the Arm Movement and Hand + Finger Movement subtests correlated highly with the Motor Imitation total score, but only modestly with each other. This contrasts with Bergès and Lézine's (1965) finding of a correlation of 0.81 between these 2 subtests in normal 3- to 5-year-old children, and indicates a weak relationship between gross and finer motor imitation skills in the present sample of physically handicapped children. The pattern of significant correlations between motor imitation performance and the language comprehension and expression measures is not very clear (see Table 16.1 and Appendix 18). Over the total sample, and also in the Bliss Users group, motor imitation scores correlated significantly but modestly with the Reynell Expressive Language Scale, with the number of spoken words the children had, and with gestural expression, but not with the Reynell Comprehension Scale, the EPVT or SPT. However, in the Makaton Signing group, motor imitation correlated significantly with the SPT and gestural comprehension and expression, but not with any of the expressive spoken language measures. The reader is again reminded of the earlier findings that, in the Bliss group, motor imitation correlated significantly with severity of physical handicap but not with the cognitive measures, whereas in the BSL (Makaton) group motor imitation correlated significantly with IQ but not with severity of handicap. Motor imitation is considered to be an index of representational ability as well as reflecting level of motor skills. So it appears that where children are severely physically handicapped, but with relatively good cognitive and language comprehension abilities (as in the Bliss group), it is the association with physical handicap that is important for motor imitation; but for children with lower levels of overall physical handicap (as in the Makaton group), there is a positive association between motor imitation and the representational skills involved in symbolic play and gestural comprehension tasks.

Finally, the Expression of Natural Gestures Test was found, over the total sample, to correlate significantly with language comprehension and gestural comprehension and (more weakly) with language expression, which is as expected in view of its reliance on representational ability, as well as its more general dependence on physical skills (as is the case with verbal expression). A similar picture emerged in the BSL (Makaton) and Bliss groups, although the correlations in the latter group fell short of significance.

A principal components analysis performed using all these measures confirms the patterns of results described above, and brings them into clearer focus. The 11 measures included in the analysis were the Reynell Expression and Comprehension Scales, the English Picture Vocabulary Test, the Symbolic Play Test, the number of spoken words the children had, the degree of speech intelligibility, the total sound development score, verbal imitation, motor imitation, and the understanding and use of gestures. The Columbia Mental Maturity Scale was also included. In view of the relatively small number of subjects in each group, the analysis was carried out on the total sample. A principal components analysis without iterations was performed, and varimax rotation was used (Child, 1970). It was decided to regard loadings of 0.4 and greater as meaningful. As can be seen in Table 16.2, the analysis yielded 2 principal factors with associated eigenvalues greater than 1, which together accounted for 72% of the total variance. The first factor, accounting for 37.9% of the variance, loaded on the Reynell Expression Scale, the number of spoken words the children used, the degree of speech intelligbility, the total sound development score, and on the verbal and motor imitation tests. As such, it is perhaps best described as a factor of motor production abilities. The second factor extracted loaded on the measures of language comprehension (the Reynell Comprehension Scale, the English Picture Vocabulary Test, the understanding of natural gestures) and on the Symbolic Play Test and use of gestures, but also on the measure of cognitive ability. While this factor may be considered as a factor of inner language or representational ability, not related to motor production, it also loaded heavily on intellectual level. As such it may well be simply the equivalent of mental age or IQ. It must of course be remembered that the patterns of correlations among these measures were not the same when examined in the Bliss and BSL (Makaton) groups separately (see above). Thus somewhat different factor structures might be found in each of the 2 groups, whose subjects were rather different in terms of the measures of language comprehension and expression, IQ and physical handicap.

Table 16.2: Principal Components Analysis of the Measures of Language Expression and Comprehension and IQ

i) Eigenvalues and Percentage of Variance Accounted for:

Factor	Eigenvalue	% Variance	Factor	Eigenvalue	% Variance
1	4.5436	37.9	7	0.3004	2.5
2	4.0836	34.0	8	0.2549	2.1
3	0.9229	7.7	9	0.1375	1.1
4	0.6208	5.2	10	0.1060	0.9
5	0.4931	4.1	11	0.0870	0.7
6	0.3855	3.2	12	0.0650	0.5

ii) Varimax Rotated Factor Matrix:

	Factor 1	Factor 2
Columbia MMS	-0.0147	<u>0.8276</u>
English Picture Vocab. Test	-0.0645	<u>0.8250</u>
Reynell Comprehension Scale	-0.1412	<u>0.8675</u>
Gestural Comprehension	0.1291	<u>0.9194</u>
Symbolic Play Test	-0.0903	<u>0.7953</u>
No. of spoken Words	<u>0.9640</u>	0.0259
Speech Intelligibility	<u>0.8727</u>	0.0765
Total Sound Dev. Score	<u>0.8583</u>	0.0707
Reynell Expression Scale	<u>0.9271</u>	0.0465
Verbal Imitation	<u>0.8642</u>	-0.1110
Motor Imitation	<u>0.4023</u>	0.3708
Use of Gestures	0.3285	<u>0.7291</u>

25.4 The Relationship Between Impairment of the Speech Musculature and Verbal Expression and Comprehension

When examining the expressive language development of cerebral palsied children, it is important to take into account the children's physical ability to produce speech sounds. The measures of functioning of the oral musculature used in the present study included a test of the coordination of tongue movements (in terms of side to side movements and licking the top lip), speech therapists' ratings of the extent of impairment of the speech musculature, and a measure of feeding difficulties, again based on speech therapists' reports. Musselwhite and St. Louis (1982) point out that feeding difficulties can provide important information on the neuromuscular status of the oral mechanism. The intercorrelations among these measures are presented in Table 17.1.

Table 17.1: Intercorrelations Among the Measures of Functioning of the Oral Musculature

	Tongue Movements licking lip	Speech musc. impairment	Feeding difficulties
i) The Total Group (n = 40):			
Tongue movements - side to side	0.77^{**}	0.52^{**}	0.58^{**}
Tongue movements - licking lip		0.49^{**}	0.55^{**}
Rating of speech mechanism impairment			0.70^{**}
ii) The Bliss Group (n = 20):			
Tongue movements - side to side	1.00^{**}	0.40^{*}	0.31
Tongue movements - licking lip		0.40^{*}	0.31
Rating of speech mechanism impairment			0.61^{*}
iii) The BSL (Makaton) Group (n = 20):			
Tongue movements - side to side	0.69^{**}	0.42^{*}	0.57^{*}
Tongue movements - licking lip		0.47^{*}	0.58^{*}
Rating of speech mechanism impairment			0.65^{**}

All the measures were significantly intercorrelated over the total sample, and all but 2 correlations remained significant when examined in the Bliss and BSL (Makaton) groups separately. The scale used to assess the extent of impairment of the speech muscles, which was devised by the present writer and was scored by the children's speech therapists, was thus shown to have good validity in terms of significant and high correlations with the measure of feeding difficulties, as well as significant (although slightly lower) correlations with the test of tongue movement coordination. As expected, the measures of feeding difficulties and of impairment of the speech musculature were also significantly correlated with severity of physical handicaps over the total sample (tau = 0.54, $P < .001$; tau = 0.47, $P < .001$), but not all the correlations remained significant in the Bliss Users group (tau = 0.27, P = n.s.; tau = 0.51, $P = .010$) and BSL (Makaton) group (tau = 0.43, $P = .017$; tau = 0.18, P = n.s.).

The next task was to examine the correlations between the measures of functioning of the oral musculature and the children's verbal expression and comprehension skills. For simplicity, only the measures of speech musculature impairment and feeding difficulties were included for this purpose. The resulting correlation coefficients are presented in Tables 17.2 and 17.3.

Over the total sample, the ratings of extent of impairment of the speech muscles, and feeding difficulties, correlated significantly and negatively with all the verbal expression measures, namely speech intelligibility, number of spoken words, sound development, the Reynell Expression Scale, and the Verbal Imitation Test. The patterns of correlations found in each of the Bliss and BSL (Makaton) groups were identical to the above, although in the Bliss group most of the correlation coefficients failed to reach significance, no doubt because of the greatly reduced variability of the speech musculature ratings in this group (85% of Bliss Users had severe to very severe impairment of the speech mechanism - see Table 15.6). These results are in close agreement with Love, Hagerman and Taimi's (1980) finding of poor articulation and overall reduced speech proficiency in those cerebral

Table 17.2: Correlations Between Functioning of the Oral Musculature and Verbal Expression and Comprehension The Total Sample (n = 40)

	Speech Mechanism Impairment	Feeding Difficulties
No. of spoken words	-0.49**	-0.50**
Speech intelligibility	-0.32*	-0.38*
Sound development - total	-0.60**	-0.57**
Reynell Expression Scale	-0.35*	-0.43**
Verbal imitation - total	-0.42**	-0.45**
Motor imitation - total	-0.06	0.01
Reynell Comprehension Scale	0.31*	0.29*
EPVT	0.15	0.18
Symbolic Play Test	0.19	0.33*

palsied children and adults having frequent feeding problems caused by neuromuscular impairment. The results also agree with Jones' (1975) findings, based on a retrospective study, that early feeding difficulties were associated with poor speech development at later ages. As noted by Love et al., speech therapy for the cerebral palsied child with dysarthria has traditionally included oromotor training to improve the functioning of oral and pharyngeal muscles, as well as the introduction of feeding programmes to improve chewing, swallowing and sucking, in the belief that this would reduce the probability of severity of future dysarthria. This belief is based on the argument that the use of the oral musculature for speech depends on its previous successful use for feeding (Ferrier and Shane, 1983). Yet there has been little research

Table 17.3: Correlations Between Functioning of the Oral Musculature and Verbal Expression and Comprehension

	Bliss Users (n = 20)		Makaton Users (n = 20)	
	1	2	1	2
No. of spoken words	-0.25	-0.21	-0.54*	-0.51*
Speech intelligibility	-0.18	-0.12	-0.28	-0.40*
Sound development - total	-0.36*	-0.42*	-0.81**	-0.53*
Reynell Expression Scale	-0.20	-0.26	-0.46*	-0.44*
Verbal imitation - total	-0.36*	-0.26	-0.47*	-0.41*
Motor imitation - total	-0.18	0.00	0.01	0.06
Reynell Comprehension Scale	0.36*	0.06	-0.09	-0.11
EPVT	0.18	0.08	-0.08	-0.13
Symbolic Play Test	0.55*	0.39*	-0.33	-0.10

Key: 1 - Rating of speech muscle impairment
2 - Feeding difficulties

on the relation between feeding difficulties or speech musculature impairment and speech performance in cerebral palsy. The trend revealed in the present study, along with the findings of Love et al., confirm the link between feeding difficulties and deficits in the development of speech skills, and thus point to the value of working on improving feeding skills in such children. However, past work with such children has shown that while such approaches may bring about some positive changes in the speech production musculature, these changes are likely to be extremely limited in all but the milder cases of motor involvement of the oral musculature (eg. Morley, in Renfrew and Murphy, 1964). Furthermore, the sizes of the correlations between the measures of speech muscle impairment and feeding difficulties and the measures of speech performance found in the present study (as well as in Love et al.'s report) were rather modest, suggesting that impairment of the oral musculature was not the only factor implicated in the children's severe deficits in spoken language. As Kiernan (1981b) has stated, control of the oral musculature represents a necessary but not a sufficient condition for the development of speech. Other factors likely to be involved were discussed in Chapter 25.2.

Turning to consider the relationship between the functioning of the oral musculature and language comprehension, it was somewhat surprising to find significant positive correlations between some of the measures of oral mechanism impairment and comprehension and symbolic play, both in the total sample and in the Bliss Users group.

Since a similar trend did not emerge in the BSL (Makaton) group (where all the correlations were negative but nonsignificant), the positive correlations that were found are likely to be accounted for by the presence, in the Bliss group, of a number of athetoid and quadriplegic children who were severely physically handicapped, with no speech and severely limited functioning of the oral musculature, but with relatively high cognitive and language comprehension skills.

Chapter 26. The Number of Symbols/Signs Taught, Understood and Produced

The children had been in symbol/sign training programmes for an average of 10½ months prior to the commencement of the study. The period of training varied between 1 and 18 months and was not significantly different for the Bliss and BSL (Makaton) groups. Over these periods the Bliss Users had been taught a mean of 68.80 Blissymbols, ranging from a minimum of 9 to a maximum of 180 symbols, while the Makaton Signers had been taught a mean of 62.85 Makaton Vocabulary signs, with a range of 1 to 135 signs. There was no significant difference between the 2 groups on this variable (see Table 18). Thus, despite the Bliss Users' higher cognitive and language comprehension skills, and despite the greater training input they were receiving in terms of weekly teaching time, by the time of baseline assessment both groups had in fact been taught roughly the same numbers of signs and symbols. Within each group, however, the number of signs/symbols taught was significantly correlated with IQ, with a correlation coefficient of 0.54 ($\underline{P}$ = .007) in each case.

Table 18: Number of Symbols/Signs Taught, Understood and Produced

	Bliss Group		Makaton Group		
	Mean	S.D.	Mean	S.D.	$\underline{t}$
No. of symbols/signs taught	68.80	56.41	62.85	38.31	0.39
No. of symbols/signs understood	54.00	47.31	34.35	27.92	1.60
% of symbols/signs understood	70.10	23.10	47.75	29.82	2.65*
No. of symbols/signs produced	50.60	42.94	28.15	25.63	2.01
% of symbols/signs produced	76.70	16.85	40.15	24.41	5.51**

The children were tested for acquisition of all the signs/symbols they had been taught at the expressive and receptive levels. As already described, comprehension of each vocabulary item was assessed by asking the child to indicate the picture (out of an array of 4) corresponding to a given sign or symbol presented by the examiner. Expressive knowledge of the vocabulary items was assessed by requiring the child to indicate the correct symbol on the Bliss chart, or execute the correct Makaton sign, in response to presentation by the examiner of a pictorial stimulus accompanied by a verbal label. On testing, the Bliss Users correctly <u>comprehended</u> a mean of 54 symbols (range 7 to 152 symbols), which, after making a correction for guessing, was calculated at 70% of the total number of symbols taught. And they were able to indicate (or express) a mean of 50.60 symbols (76.70% of the symbols taught), with a range of 9 to 146 symbols correctly indicated. The BSL (Makaton) group correctly <u>comprehended</u> 34.35 signs (i.e. 48% of the signs taught, after making a correction for chance selection of the correct picture), with the number of signs comprehended ranging from 1 to 97. And they were able to correctly <u>produce</u> a mean of 28.15 signs (40.15%), ranging from 1 to 97 signs. Comparisons between the Bliss and BSL (Makaton) groups showed that the Bliss Users were able to understand and produce a significantly greater percentage of the total vocabulary items taught than the Makaton Signers (see Table 18). These results are hardly surprising in view of the earlier findings that the Bliss group attained significantly higher scores on the cognitive, perceptual and language comprehension measures that were used in the study, when compared with the BSL (Makaton) group. The greater weekly teaching input which the Bliss Users received may also be relevant in helping to account for their better performance on the symbol comprehension and production tasks.

As found in other studies, the children revealed a wide range of individual differences in terms of sign/symbol acquisition; but even the least able of the BSL (Makaton) group acquired at least 1 sign at the expressive and receptive levels, while the lowest numbers of symbols understood and produced by Bliss Users were 7 and 9 respectively. Comparison with other studies is difficult, both because of differences in the types of subjects used and amount of training given, and because of the minimal information typically provided in these reports on subject characteristics, training input, and on how sign/symbol acquisition was assessed. Nevertheless, in general terms, the present findings on the sizes of the children's sign/symbol vocabularies appear to compare quite favourably with those reported in other studies. For example, Song's (1979) mentally handicapped cerebral palsied subjects only learned to understand and use between 3 and 46 Blissymbols after 10½ months of training; while Harris-Vanderheiden, Lippert, Yoder and

Vanderheiden's (1979) longer term study with profoundly to mildly mentally handicapped cerebral palsied children, showed acquisition of between 60 and 200 Blissymbols after 30 to 41 months of training. The present findings on sign acquisition by the BSL (Makaton) Users appear to be slightly more favourable than the results quoted by Kiernan, Reid and Jones (1982), who found that amongst ESN(S) School children in sign programmes of 6 to 18 months duration, the median child could understand only between 11 and 20 Makaton signs, and use between 5 and 10 signs. Even among more competent children, the median child understood only between 21 and 30 signs and used between 11 and 20 signs, still below the means found in the present study. Unfortunately, since the figures quoted by Kiernan et al. are based on postal questionnaires sent to schools, the children are described only in rather general terms. It is thus not possible to ascertain the precise reasons for what appears to be their poorer average achievement when compared with the present subjects. Possible explanations are that acquisition (i.e. understanding and use) was interpreted differently, or that schools were underestimating children's performance, or that overall training input was much less than that reported in the present study. The average vocabulary size of the present group of signers also appears to be greater than that reported by Bailey and Tait (1979) for 5 severely mentally handicapped children aged 13 to 17 years. After 12 months of training, these children were reported to understand between 4 and 41 BSL (Makaton) signs, and to use only between 0 and 4 signs. Again, the authors provide few details about the subjects, and no information on how understanding and use of signs were assessed. However, these subjects received very little sign training (only 20 minutes per week) when compared with the present sample.

While the data on the present subjects' sign/symbol vocabulary acquisition appear quite favourable when compared with these other reports, the poverty of their vocabulary repertoires in 'real terms' is particularly striking when one considers that normal, speaking 6- or 7-year-old children have thousands of words available to them. Over 40% of the children in the present study had IQs above 70 ; yet the greatest number of vocabulary items available to any one child (admittedly after an average of only 10 months on the systems) was 180 symbols. Thus many of the children were being asked to communicate with finite and restricted vocabulary sets which were below their needs and abilities, and which were unlikely to reflect their knowledge of the world, or their representational abilities on a cognitive level

(Yoder and Kraat, 1983). The use of Blissymbol strategies can be of advantage here, in that the vocabulary available to a given child can be expanded by combining various semantic notions (see Chapter 6.3). However, at baseline there was only 1 Bliss User who had been taught only 1 of the Blissymbol strategies, namely the use of the ACTION INDICATOR (a symbol which, when used with other Blissymbols, gives them a verb meaning).

Certainly it must be borne in mind that the size of the sign/symbol vocabulary that is made available to a child will be determined not only by the child's ability and motivation to learn the vocabulary items, but also by the teacher's or speech therapist's views of the child's abilities and needs. In other words the number of signs and symbols children are taught depends as much on how quickly the teacher wishes to introduce new signs/symbols as on how quickly the child is able to learn these items. This distinction is not as subtle as it may appear. The present writer encountered several cases where children could understand and indicate most or all of the symbols that had been taught, but where the speech therapists were reluctant to introduce more symbols immediately because it was felt that those symbols already available were not being used to a sufficient extent. It is open to question whether, in such cases, the provision of more symbols to widen the child's communicative repertoire would in itself help to foster greater spontaneous usage of the augmentative system. The amount of teaching time available is another factor which will influence the rate at which new signs/symbols are introduced. Among the intriguing questions that require further research are, firstly the implications for vocabulary acquisition (and use) of placing children in total communication environments, with continuous exposure to sign/symbol use; and secondly the question of whether those children who acquired few signs/symbols, would in fact have learned more vocabulary items if 'simpler' systems (eg. pictorial systems, Amer-Ind gestures) had been used.

Comparing the numbers of signs/symbols known at the expressive and receptive levels, it was found that significantly more vocabulary items were learned receptively than expressively over the total sample ($\underline{t}$ = 3.19, $\underline{d.f.}$ = 39, $\underline{P}$ = .003) and in the Makaton Signers group ($\underline{t}$ = 2.48, $\underline{d.f.}$ = 19, $\underline{P}$ = 0.23). The same trend was apparent for the Bliss Users, although the difference here fell short of significance ($\underline{t}$ = 2.01, $\underline{d.f.}$ = 19, $\underline{P}$ = .058). Other researchers, too, have found that expression of signs lags behind understanding (eg. Konstantareas, Webster and Oxman, 1979; Walker, 1973); and Konstantareas et al. used this finding to point to parallels with what some psycholinguists believe to be a characteristic pattern of speech development in normal children, namely of comprehension of spoken language antedating production (Bloom, 1970; Brown, 1973). However, when the present writer compared the percentages of signs/symbols produced and understood, once a correction for guessing was made in the comprehension task scores, the differences between receptive and expressive performance were no longer significant (for the total group $t = 0.13$, $d.f. = 39$, $P = .898$; for the Bliss Users group $t = 2.00$, $d.f. = 19$, $P = .060$; for the Makaton Signing group $t = 1.13$, $d.f. = 19$, $P = .272$). Thus the significant differences between sign/symbol production and comprehension reported in other studies, may have been due to artifacts in testing comprehension, in that comprehension is often assessed by presenting subjects with an array of pictures and asking them to identify the picture referred to by a sign or symbol, but with no correction being made for chance selection of the correct response (eg. Walker, 1973).

Given the differences between the Bliss and BSL (Makaton) groups in IQ, degree of physical handicap and language comprehension, a final question to be examined in this chapter concerns differences between the 2 groups in sign/symbol acquisition, after removing the variation due to the variables enumerated above. When analysis of covariance procedures were applied, using the Columbia MMS, degree of handicap and Reynell Comprehension scores as covariates, no significant differences between the Bliss and BSL (Makaton) groups were found on the percentage of signs/symbols learned receptively ($F = 0.968$, $P = .332$). However, the difference between the groups on expressive knowledge of the vocabulary items remained significant ($F = 7.145$, $P = .011$). This difference was still significant when weekly sign/symbol teaching time was added as a fourth covariate ($F = 7.094$, $P = .012$). In other words, after controlling for differences between the groups in intelligence, physical status and language comprehension skills, Blissymbols appeared to be easier to learn at the expressive level than BSL (Makaton) signs. While it cannot be claimed that the analysis of covariance procedure used here resulted in absolute equivalence of the 2 groups of children, this finding would certainly appear to support the claim made by Kiernan (1983a) and others that symbol systems are easier to use than sign systems because they involve recognition rather than recall. As Kiernan explains, symbols place fewer cognitive demands on the users than do manual systems because, to use symbols, the individual needs to be able to associate meaning with a visuo-spatial pattern, and then to recognize the symbol and indicate it. This side-steps any requirements of recall, since the symbols are continuously present. Sign systems, on the other hand, require the user to be able to discriminate, imitate, learn and recall the signs. Recognition is clearly a much simpler information processing task than recall. It will be interesting to see if this advantage for Blissymbolics is borne out when comparing the Bliss and BSL (Makaton) groups on use of the systems in semi-structured conversational settings, since this could have major implications in terms of recommendations for system selection, at least as far as cerebral palsied children are concerned. This crucial issue will be examined in the following chapter, where conversational use of the 2 augmentative systems will be described and compared.

Measuring the size of the children's sign/symbol vocabularies, as described in this chapter, is clearly important. However, the real goal of augmentative communication training is meaningful use of the signs or symbols in communicative settings. The writer therefore now turns to consider syntactic, semantic and pragmatic analyses of the sign and symbol utterances produced by the children in semi-structured conversational settings.

Chapter 27. Analyses of the Children's Symbol and Sign Language Samples

Examples of the sign and symbol utterances produced by the children in the 30-minute recording sessions are presented in Appendix 19. All the utterances are presented in English gloss form and are accompanied by contextual notes. Where it is felt necessary to clarify communicative intent, English sentence paraphrases of the utterances are also given. As can be seen in the appendix, once a child formulated an utterance (particularly using Blissymbols), the adult often had to repeat or paraphrase it, in order to check whether her interpretation of the message was accurate. The procedure used to record the children's sign and symbol productions was described in Chapter 19.3.3. It is important to reiterate at this point that only specified Makaton signs and Blissymbols were transcribed for analysis. The majority of the children also used gesture, facial expression, pantomime, and occasionally also spoken words, in order to convey communicative intent. Such behaviours were noted down as part of the context in which signs and symbols were produced, in order to help clarify semantic and pragmatic intent; but they were not themselves subjected to analysis.

In view of this, the data presented in this chapter cannot be considered as giving a full picture of the children's communicative competence in modes other than Blissymbolics and BSL (Makaton) Signing.

The sign and symbol utterances produced by the children were subjected to analysis on three levels - syntactically, semantically, and in terms of the communicative functions expressed. The following discussion examines differences between the Bliss and BSL (Makaton) groups on these measures, as well as the question of whether augmentative communication samples reflect semantic, syntactic and pragmatic features which are similar to spoken language samples, or whether the nature of augmentative modes makes communicative usage qualitatively and/or quantitatively different.

27.1 Description of the Sign and Symbol Samples in Terms of General Indices of Syntactic Development

In the half-hour recording session all 20 Bliss Users, and 15 of the 20 BSL (Makaton) Signers, produced at least 1 symbol/sign utterance each; 5 Sign Users produced no sign output at all in the semi-structured conversational settings. The following analyses are therefore based on the sign/symbol output of 35 children. As can be seen in Table 19.1, the Bliss group produced a mean of 12.80 total utterances (range 2 - 40

Table 19.1: General Indices of Syntactic Development Characterizing the Blissymbol and BSL (Makaton) Expressive Language Samples

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 15)		
	Mean	S.D.	Mean	S.D.	t
Total No. of utterances	12.80	9.62	11.13	10.25	0.49
% spontaneous utterances	41.00	16.13	49.13	31.71	0.91
% response utterances	59.00	16.13	50.87	31.71	0.91
Mean length of utterance	1.43	0.43	1.11	0.27	2.57*
% single-term utterances	70.40	24.74	91.53	20.82	2.67*
% 2-term utterances	18.05	14.21	7.27	18.03	1.99*
% 3-term utterances	9.95	16.27	0.60	2.32	2.54*
% 4-term & longer utterances	1.55	5.09	0.60	2.32	0.74
% multi-term utterances	29.55	24.73	8.47	20.82	2.67*

utterances); on average, 41% of these utterances were spontaneous, child-initiated utterances, not in response to preceding verbalizations by the adult (range 12% - 75%), while 59% of the utterances were responses to questions, commands or statements produced by the adult (range 25% - 88%). The mean number of total utterances produced by the BSL (Makaton) group was 11.13 utterances (range 1 - 37 utterances); an average of 49.13% of these were spontaneous utterances (range 0% - 100%), while 50.87% were response utterances (0% - 100%). There were no significant differences between the percentages of spontaneous and response utterances produced over the total group, nor within the BSL (Makaton) group ($\underline{t}$ = 1.36, d.f. = 34; $\underline{t}$ = 0.11, d.f. = 14). However, a significantly greater percentage of the Bliss Users' utterances were responses compared with spontaneous utterances ($\underline{t}$ = 2.49, d.f. = 19, $\underline{P}$ = .022). These findings will be elaborated upon below.

These figures suggest poor use of the augmentative systems, with very few utterances being produced during the recording sessions, and with just under half of the total utterances being spontaneously initiated. The corpus of Blissymbol utterances had a mean symbol length of utterance (MSLU) of 1.43 (range 1.00 - 2.50), and the corpus of signed utterances had a MSLU of 1.11 (range 1.00 - 1.91). These figures place the majority of children in Stage I of Brown's (1973) 5 stages of early language development, the stage at which children are just beginning to combine words and have MLUs below 2.00. This finding, and the data presented in Table 19.1 on percentage distribution of utterance lengths, indicate that very few of the children used sign or symbol combinations. The great majority of utterances produced were single-term utterances. On average, only 29.55% of the Blissymbol utterances (range 0% - 80%) and only 8.47% of the sign utterances (range 0% - 60%) were multi-term utterances; 18% of all the Bliss Users' utterances and 7% of the BSL (Makaton) Users' utterances were 2 symbols/signs in length, and only 10% of the symbol utterances and under 1% of the signed utterances were 3 symbols/signs in length. The sign and symbol utterances rarely exceeded 3 sign/symbol combinations. However, the ranges quoted above also indicate that there was considerable variability between children in terms of the frequency with which sign/symbol utterances and multi-term utterances were produced.

There were no statistically significant differences between the Bliss and BSL (Makaton) groups in terms of the total number of utterances produced during the recording sessions, nor in terms of the percentages of utterances which were spontaneous productions or responses to prior adult verbalizations (see Table 19.1). However, significant differences were found between the groups on the measures of utterance length. The corpus of Blissymbol utterances had a significantly greater MSLU when compared with the corpus of signed utterances, indicating that the Bliss Users were on average producing utterances of greater length. Furthermore, the distribution of sign and symbol utterance lengths, also shown in Table 19.1, reveals that the Bliss Users produced significantly fewer single-term utterances, and significantly more 2- and 3-term utterances, when compared with the Makaton Signers. There was no significant difference between the groups in terms of the percentage of 4-term utterances or longer utterances which were produced, but very few utterances in either group were in fact of this length.

The finding that the Bliss Users were producing symbol utterances of significantly greater length accords with the earlier finding that this group also understood and produced a significantly greater percentage of the total number of symbols they had been taught, when compared with the BSL (Makaton) group (see Chapter 26). Kiernan, Reid and Jones (1982), in their survey of the use of signs and symbols in special schools, also found that children in Blissymbol programmes were more capable than children in signing programmes in terms of the ability to use symbol combinations. Again, it must be said that these findings are hardly surprising in view of this group's better performance on the cognitive, perceptual, and language comprehension measures that were administered. What does perhaps need to be explained is the finding that both groups produced approximately the <u>same</u> mean number of total utterances. Given the Bliss Users' higher levels of ability overall, they may also have been expected to produce a greater number of total utterances. However, it is important to bear in mind that the Bliss Users were significantly more <u>physically</u> handicapped than the Makaton Signers. Because of their physical handicaps, symbol indication was in most cases a slow and laborious process, very much more time-consuming that signing. In general, it took the Symbol Users very much longer to indicate each symbol when compared with the time it took the Sign Users to execute signs. Given the fixed length of the recording sessions, and the fact that the symbol utterances were of greater average <u>length</u> than the sign utterances, the absence of significant differences between the groups in terms of the <u>total</u> number of utterances produced can be readily explained.

The differences between the Bliss and BSL (Makaton) groups on the above measures were further examined with analysis of covariance procedures, using IQ, severity of physical handicap and Reynell

Comprehension Scale scores as covariates. The results of these analyses are presented in Table 19.2. As can be seen, the differences between the 2 groups on the measures of utterance length were no longer significant, indicating that the Bliss Users' advantage on these measures could be fully explained by the effects of the covariates.

Table 19.2: Differences Between the Bliss and BSL (Makaton) Groups on General Indices of Syntactic Development, Using IQ, Severity of Handicap and Reynell Comprehension Scores as Covariates

	F	P
Mean length of sign/symbol utterance	1.750	.196
% single-term utterances	1.135	.295
% two-term utterances	0.033	.856
% three-term utterances	1.275	.268
% multi-term utterances	1.147	.293

It will be recalled that the Bliss Users were found to have acquired significantly more symbols at the expressive level, compared with the Makaton Signers, even after controlling for differences between the groups on IQ, language comprehension and severity of handicap (see Chapter 26). This advantage for the symbol system is not borne out in the present findings on sign and symbol use in semi-structured conversational settings. It may be concluded that although Blissymbols appear to be easier to learn than BSL (Makaton) signs (perhaps because symbol indication involves only recognition, whereas sign production also requires recall), once signs and symbols have been acquired, neither mode is likely to foster greater facility in use, at least in the kinds of conversational settings employed in the present investigation. This finding fails to bear out Kiernan, Reid and Jones' (1982) contention that the permanence of symbols makes it easier to produce multi-item utterances using Blissymbols than using signs. It may be that sign systems have their own advantages over the symbol systems in terms of spontaneity and immediacy; furthermore, teachers are more likely to model sign use by speaking and signing simultaneously, whereas Bliss Users are less likely to have adult models of symbol use - the tendency here is for the adult to use speech while the child points to the symbols. The different advantages of each system may have led to the present finding that, overall, neither resulted in a greater degree of conversational use compared with the other.

On the whole, the data present a rather disturbing picture of poor augmentative system use, with few utterances being produced during the recording sessions, and these being mostly 1 sign/symbol long. While a few children were able to express their thoughts and feelings in a way that could be understood (see Appendix 19), the average of 11 to 13 total utterances produced by the children contrasts sharply with the hundreds of spoken utterances typically produced by normal and even language disordered children in half-hour recording periods (eg. Brown, 1973; Miller, 1981; Udwin and Yule, 1982b). Crystal, Fletcher and Garman (1976) found, for example, that 30 minutes of interaction usually produced between 100 and 200 utterances in children functioning above a 24-month level, and that even children functioning at 18- to 24- month levels produced between 30 and 60 spoken utterances. Similarly, the MSLUs found in the present study (a mean of 1.43 for the Bliss Users and 1.11 for the Makaton Signers) have been found by Brown (1973) and Miller and Chapman (1981) to be characteristic of speaking, middle-class children aged under 2 years.

The few studies conducted to date on the use of sign and symbol systems in naturalistic settings, provide confirmation for the present findings of severely limited amounts of communication, and give cause for concern on the question of how effectively augmentative systems are being taught. Oxman and Blake (1980) presented data on the use of signs by 10 autistic children who were observed in 30-minute play sessions. No information is provided on the length of time the children had been exposed to sign training, but they were reported to have produced a mean of just over 50 sign utterances during the recording sessions, with about half of the utterances being directly imitative. Furthermore, as was found in the present study, the majority of the children's utterances consisted of only 1 sign each, and the mean MLU obtained was 1.31. Calculator and Dollaghan (1982) observed 7 cerebral palsied Bliss Users interacting with their teachers during 30-minutes semi-structured sessions. The subjects were moderately to profoundly mentally handicapped, were aged 8 to 25 years, and had been using Blissymbols for 2 years. The students rarely used their communication charts in spontaneous classroom interactions. The average of only 16 Blissymbol utterances produced during the recording sessions, which were mostly 1 or 2 symbols long, agrees very closely with the findings for the present sample.

In the observational studies of Calculator and Dollaghan (1982), Harris (1982), and Light (1985), the verbal partner was found to play a dominant and controlling role, often not expecting a response from the Bliss user. This control extended to topic selection, the level and length of the interaction, and the degree of participation possible from the augmentative system user. When communicative exchanges did occur, these were often characterized by yes/no questions from the verbal partner, or questions requiring a limited response from the system user. These studies further showed that communication occurred mostly through modes other than the symbol systems, despite the fact that these alternate modalities (eg. gesture, pointing) had previously been judged sufficiently inadequate to warrant the use of an augmentative system. For example, Calculator and Dollaghan found that their subjects used Blissymbols for only 11% of their spontaneous messages and for only 21% of their responses. An additional aspect of the communicative interactions which is highlighted in these studies is that the augmentative system users appeared primarily as respondents and as passive partners in the interactions. Calculator and Dollaghan showed that their Bliss Users occupied the respondent role nearly 3 times as frequently as the initiator role, while Harris found that communication board users used their boards almost exclusively to express responses to teachers' instructions or questions, whereas teachers did most of the initiating. Harris attempted to describe the nature of these classroom interactions and the reasons why the children she observed rarely initiated communications. She noted that general interest conversations rarely occurred; communicative interactions with the children were usually initiated with a specific purpose in mind (eg. to ask a question related to physical care), and the children were rarely allowed time to express more than single-term responses. Another reason for the children's primarily respondent roles may be that the functions of the children's nonverbal messages are often interpreted by the adult, and the child needs only to confirm or deny the match between his intended message and the message interpreted by the message receiver.

Interestingly, the predominance of response utterances at the expense of spontaneous initiations found in the above observational studies was not confirmed in the present investigation. The BSL (Makaton) Users' utterances were almost equally divided between spontaneous and response utterances, while the Bliss Users produced only slightly more responses than spontaneous initiations (59% responses versus 41% spontaneous utterances). The differences between these findings and those of Harris, and Calculator and Dollaghan, may be explained in terms of the different settings in which the language samples were collected. These other writers observed communicative interactions with teachers in classroom settings; whereas the samples gathered in the present study involved interactions with the investigator under conditions which were free from distractions and the pressures of time (except for the overall time limit of the 30-minute session), and in which the children had the adult's undivided attention. The children were not bombarded with yes/no questions, but rather were actively encouraged to produce as many and as lengthy utterances as they could and wished to. It must however be said that the children still produced many yes/no responses; but since these were mostly in the form of gestures (head shakes and nods, facial expressions etc. - that is, non Bliss/Makaton messages), they were not included in the records for analysis. The proportion of such responses is thus clearly underestimated in the present data.

Examination of the communicative environments of physically handicapped and nonverbal individuals suggests several factors which may help to account for the picture of poor augmentative system use described above. Successful augmentative communication depends first and foremost on motivated communicative behaviour from the individual. But, as Kraat (1982) has pointed out, physically handicapped, non-verbal persons typically bring to augmentative system use well established patterns of non-communication, passivity, and limited physical and cognitive experiences, which will strongly affect the interactions that occur when a sign or symbol system is implemented. Such individuals are likely to have been placed in a passive role for many years, and to have learned ways of interacting and communicating that reflect this role. These usually consist of answering yes/no questions, of having their needs predicted and met, and having others guess and expand on their few communicative attempts. Harris-Vanderheiden and Vanderheiden (1977), too, stress that since these children's needs and wants are in most cases automatically provided for or guessed by others, they often have no pressing need to develop a communication mode, but become instead passive observers of others' interactions. Moreover, if the child's past attempts to communicate have required much effort, with little reward in the way of satisfactory transmission of intent, there will clearly be a dulling effect on the child's desire to communicate. Many of these children lack knowledge or experience with the meaning and power of communication.

When an augmentative system is introduced, the individual is suddenly being asked to shift from a passive respondent role to one of initiating communications (Yoder and Kraat, 1983); it is little wonder that he/she does not start using such a system to interact and initiate communication as soon as it is introduced. In this connection, it is worth remembering that the children included in the present study had only been exposed to sign and symbol modes for an average of 10 months prior to baseline assessment.

Another difficulty facing augmentative system users is that they are being asked to use these systems within environments that are not used to them. As Yoder and Kraat (1983) point out, teachers and family members typically continue to use their old patterns of talking to the nonverbal person, and do not shift their expectations or style (Calculator and Dollaghan, 1982; Harris, 1982). In the present sample, for example, it was found that in only one case was a child placed in a signing environment throughout the school day (see Chapter 24). The data on exposure to the systems at home (to be presented in a later chapter) further reveal only limited use of signs and symbols by parents. Thus nonspeakers have few everyday models of sign/symbol use. The communication models they are familiar with are vocal speakers, not augmentative system users.

Additional factors that are likely to influence the nature and quality of augmentative system use and to account for the few utterances produced in recordings, relate to the characteristics of the systems themselves. One of the major differences between these systems and speech is in the rate of communication. Symbol communication is significantly slower than speech; and signing, although faster than symbol communication, is also very slow in comparison with speech. Scanning type devices used with the most severely physically handicapped may, for example, produce as few as 2 symbols per minute, while direct selection may result in rates of 6 to 25 symbols per minute (Foulds, 1980). This is in marked contrast with the 126 to 172 words per minute available in vocal speech. As has been pointed out by Yoder and Kraat (1983), this imbalance in the rate of communication seriously affects the nature of communicative interactions that occur. Because of this discrepancy, the vocal partner has the power to control the nature and length of interactions. The slower nonverbal communicators will therefore have difficulty getting conversational entry, continuing conversations beyond 1 utterance, and terminating them when they wish. Because augmentative communication is more effortful both physically and in terms of the time required, users are likely to communicate only basic needs, and leave less salient communications unsaid. Additionally, they may reduce utterances to the least possible number of words, or use gestures or vocalizations instead of signs or symbols, to effect quick communication. These means of expression can be efficient, but may also result in ambiguities and misinterpretations. The verbal partners, for their part, are unlikely to encourage lengthy and elaborated communications. They will often attempt to speed up interactions by barraging the system user with questions that require only 1-word answers, by asking and answering their own questions, by producing utterances that do not require participation from the user, or even by expanding the beginning of a response into what they think the system user wants to communicate.

The use of manual and symbol systems brings with it further restrictions in terms of vocabulary size and the meanings that can be expressed. Whereas the normal child has thousands of words available to him/her, the augmentative system user is asked to communicate with a very small, restricted vocabulary set which, in many cases, is well below his/her needs and abilities. The user thus has the capability to 'say' much less, since many meanings and forms of expression are unavailable to him/her (Kraat, 1984). Finally, Kraat also highlights the growing recognition that the augmentative communication training procedures typically used are partly to blame for poor interaction and system use. Most training studies focus only on sign/symbol vocabulary acquisition, and provide no training in actual communicative use within the natural environment.

All these factors may help to explain the severely limited amounts of communication found in the present study and by other researchers.

The growing realization that sign and symbol use do not necessarily follow on naturally from vocabulary acquisition, brings with it implications for re-examining intervention approaches, and for actively training system use. There are several suggestions in the literature as to how this may be achieved. Adults must work on retraining nonspeakers to modify old habits, and on building up and reinforcing higher rates of spontaneous initiations in functional settings that include a variety of people, objects and contexts. They themselves need to relinquish dominance of interactions and guessing the nonspeaker's intended messages, and provide the nonspeaker with sufficient opportunity and time in which to formulate and express messages. Specific training techniques may need to be used, for example procedures for fading stimulus objects out of the sight of the child, and then fading the teacher's prompts, so that the child's sign/symbol repertoire comes under the control of a more general stimulus - the mere presence of an attending second person (eg. Carr and Kologinsky, 1983). More generally, it is essential to show such individuals that their efforts at sign/symbol communication can affect their environment in a reliable manner, and furthermore to train significant others to use the systems with the children, and so to become effective models of system use.

27.2 Syntactic Analysis of the Sign and Symbol Language Samples Using the LARSP Procedure

It may be argued that using normal language models of syntactic analysis for augmentative system use is wholly inappropriate, since to be successful with such systems a user frequently needs to break down conventional linguistic rule usage, for example by using telegraphic utterances to effect speedier message transmission (Yoder and Kraat, 1983). Furthermore, as discussed in earlier chapters, BSL and Blissymbolics have their own recommended syntactic patterns, which differ from English syntax to a greater or lesser extent. On the other hand, all teachers teach the signs or symbols as equivalent to English words, and most use - and expect their pupils to use - signs and symbols within the framework of English syntactic structures. Determining the extent to which the children's symbol and sign utterances reflected the use of English syntactic structures was therefore felt to be an important question.

Crystal, Fletcher and Garman's (1976) LARSP profile was used in order to examine the grammatical structures produced in the sign and symbol utterances. The profile, which is described in detail in Chapter 19.3.3, presents over 100 syntactic structures to be scored. Unfortunately, the authors provide no procedure whereby these structures can be readily condensed into syntactic scores or similar summary measures. The Bliss and BSL (Makaton) groups' mean scores on the full set of structures are presented in Appendix 20, in terms of both the frequency of occurrence of each structure, and the percentage of utterances (out of the total number of utterances) entered in each category of structure. Table 20 provides a number of summary measures of performance on the LARSP profile.

Comparison of the performance of the Bliss and Makaton Users on the syntactic structures listed in Appendix 20 reveals very few

Table 20: Performance of the Bliss and BSL (Makaton) Groups on the Summary LARSP Measures

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 15)		
Summary LARSP Measures	Mean	S.D.	Mean	S.D.	t
% verbs out of single-term utterances	12.50	13.27	22.27	27.43	1.27
% nouns out of single-term utterances	81.70	13.16	67.20	26.91	1.92
% 'other' out of single-term utterances	2.55	5.67	8.00	11.28	1.72
% of Stage I entries out of entries at Stages I-V	66.40	28.00	88.80	23.64	2.50*
No. of clause entries at Stage II	2.20	2.44	1.00	2.20	1.50
No. phrase entries at Stage II	1.55	2.59	0.40	1.12	1.78
No. clause entries at Stage III	1.10	1.97	0.00	0.00	2.15*
No. phrase entries at Stage III	1.40	2.62	1.33	2.02	0.08
No. clause entries at Stage IV	0.05	0.22	0.00	0.00	0.86
No. phrase entries at Stage IV	0.05	0.22	0.13	0.52	0.65
Total No. complex utterances	0.00	0.00	0.00	0.00	0.00
% Stage II clauses out of phrases+clauses at Stage II	69.13	31.41	78.00	22.00	0.46
% Stage III clauses out of phrases+clauses at Stage III	37.73	41.29	0.00	0.00	2.21*
% Stage II clauses out of clauses at Stages I-II	19.20	16.27	6.73	16.39	2.24*
% Stage III clauses out of clauses at Stages II-III	20.14	27.75	0.00	0.00	1.23
% clauses at Stage II with phrase expansions	15.50	28.62	0.00	0.00	0.91
% clauses at Stage III with phrase expansions	18.33	28.58	0.00	0.00	1.57

significant differences between the 2 groups. The signing group produced significantly more single (Stage I) verbs than the Bliss group, while the Bliss group produced significantly more Stage II adverbial clauses and more noun + noun phrases (also at Stage II) than the BSL (Makaton) group. In view of the large number of categories involved, these few significant differences may have been simply due to chance. On the other hand, there are ready explanations for these differences. It may well be that action concepts were less meaningful for the Bliss Users, and so were more difficult for them to acquire and use, because these children were more severely physically handicapped than the Makaton Signers. Additionally there are likely to be differences between the sign and symbol media in the way verbs and nouns are represented. Because nouns are easier to depict pictorially, they may be easier to learn and thus use in a symbol medium than in a sign medium. In contrast, actions are easier to depict manually than pictorially, and so may be easier for signers to acquire and hence use. On the LARSP summary measures, the Bliss Users produced a significantly lower percentage of Stage I entries (out of total entries at Stages I to V), and a significantly greater percentage of Stage II clauses (out of Stages I + II clause entries), when compared with the Makaton Users (see Table 20). The Bliss Users also produced significantly more clauses at Stage III, in comparison with the Makaton Signers. These results are in accord with the earlier finding that the Bliss group produced utterances of significantly greater length than the Makaton group (see Chapter 27.1).

The differences that were found between the 2 groups are thus as expected, but they are very few in number. Despite earlier findings that the Bliss Users were significantly more able than the Makaton Signers in terms of IQ, language comprehension and the number of vocabulary items that were acquired, the 2 groups did not differ significantly on the great majority of LARSP structures. This may well be due to the fact that both groups produced relatively few utterances, which were mostly 1 sign/symbol in length. The LARSP summary measures on which differences between the groups were found, were then subjected to analysis of covariance procedures, using IQ, severity of physical handicap and Reynell Comprehension scores as covariates. The resulting differences between the Bliss and BSL (Makaton) groups were no longer significant ($F = 0.795$, $P = .380$; $F = 2.227$, $P = .146$; $F = 1.289$, $P = .265$). As was the case with regard to sign and symbol utterance length (see Chapter 27.1), these findings, too, fail to corroborate Kiernan's (1983a) argument that symbol systems are easier to use than sign systems because they involve recognition rather than recall, and because they involve an external prop (the symbol chart) for sentence construction.

The overall picture yielded by the LARSP profiles is of relatively few entries, with the majority of these being Stage I (single-term) structures. Thus 59% of all symbol utterances and 62% of all sign utterances comprised single nouns, and a further 6% of symbol utterances and 20% of sign utterances comprised single verbs. There were very few clause and phrase entries in Stage II, fewer still in Stage III, and almost no Stage IV structures. Complex sentence structures (scored in Stage V) were not produced at all. The percentage of Stage I entries out of the total entries in Stages I-V was 66% for the Bliss utterances and 89% for the sign samples. Of the two-term utterances which were produced (Stage II), the most frequently used clause structures were subject + verb (used in 3% of all Bliss utterances and 2.5% of all sign utterances) and subject + object/complement structures (used in 3% of symbol utterances and 1.2% of sign utterances). The adverbial + X clause structure appeared in 7.25% of symbol utterances, but in only 0.8% of sign utterances. The most frequently used Stage II phrase structures were noun + noun and preposition + noun; however, while these were used in 5.3% and 2% of Bliss utterances respectively, they were used hardly at all in the sign utterances. The most frequently used of the Stage III clause structures were the subject + verb + adverbial structure and subject + verb + object structure, but these were used in only 3.5% and 1.7% of symbol utterances, and in no sign utterances. Pronouns (a Stage III phrase entry) appeared more frequently - in 9% of symbol utterances and 7% of sign utterances. As already noted, with the exception of some isolated instances of the use of the conjunction 'and' and the Q + X + Y + question structure, there were no entries in Stages IV and V, indicating the almost total absence of complex sentence structures. The expansion of clause structures (given by Stage II and III Expansions) was also very rare. The Makaton Signers used no clause expansions at all, while among the Bliss Users only 15.5% of Stage II clauses and 18.3% of Stage III clauses involved the integration of phrase structure into clause structure.

Even at Stages I, II and III, there were many syntactic structures which did not appear at all, or appeared only once or twice, in the entire corpus of sign and symbol utterances. These included question and command forms, negative constructions, determiners (a, the), adjectives, auxiliary verbs, and the copula. It is relevant to point out that the use of many of these structures requires specific vocabulary items (eg. determiners, the copula, question words), which are usually not made available to beginning Bliss and Makaton Users. The absence of these syntactic structures from the children's sign and symbol samples may thus reflect the lack of appropriate vocabulary. Furthermore, negatives and questions, although not expressed with Blissymbols or signs, were occasionally expressed through the use of gesture (head shakes, facial expressions), and as such were not included in the analyses.

The low frequencies of the ambiguous and incomprehensible categories, and of the categories of 'other clauses' and 'other phrases', indicate that most of the sign and symbol utterances could be placed in meaningful LARSP categories, i.e. that the LARSP profile was suitable for examining the syntactic structures in sign and symbol utterances.

There are no normative data on LARSP; but the work of Bamford and Bench (in Crystal, 1979) and Fletcher (personal communication, 1983) suggests that language samples produced by 4- and 5-year-old normal speakers consist largely of Stage III and IV entries on LARSP, with some Stage I and II entries, and with a fair proportion of sentence connectivity devices and complex sentence patterns. The present findings, which showed the Bliss and BSL (Makaton) Users to be using largely Stage I entries, with a few Stage II and III entries, and almost none of the advanced clause and phrase entries of Stages IV and V, thus suggest deficits on all fronts. According to Crystal, Fletcher and Garman (1976), this picture is characteristic of speaking children aged under 2 - 2½ years. Interestingly, it may be recalled that the MSLUs of the Bliss and BSL (Makaton) groups (a mean of 1.43 for the Bliss Users and 1.11 for the Makaton Users) were found by Brown (1973) and Miller and Chapman (1981) also to be characteristic of speaking children aged under 2 years. However, in addition to the general impression of language delay suggested above, and the greatly reduced frequency of entries over the profiles as a whole, there were also some complete gaps in structural ability, with certain Stage I, II and III structures being rarely or never used (eg. negatives, commands, questions, determiners and adjectives).

No other studies have systematically examined the syntactic structures produced by sign and symbol users. However, there are a few anecdotal reports which would seem to confirm the present finding that system users lack many of the linguistic skills of younger normal children, be it in terms of quantity or complexity of utterances produced (Bonvillian and Nelson, 1978).

There are a number of possible explanations for the limited development of complex and varied language structures found in the sign and symbol protocols. These have been discussed in depth in preceding chapters and so will be only briefly reviewed here. Clearly, the limited intellectual and language comprehension abilities of many of the children, and their lack of productive experiences with language, are likely to affect both the quantity and quality of sign/ symbol use. Furthermore, the children had had relatively little exposure to the systems up to the time of baseline assessment, with an average of only 1½ hours of weekly training over 10 months, and with few everyday models of Bliss/BSL (Makaton) use. Moreover, the recommended BSL (Makaton) approach of signing only key words meant that the Signers were not exposed to sophisticated syntactic models of sign use, even in direct training sessions. Other reasons for the present findings are likely to lie in the systems themselves. The Bliss and Makaton Users are required to communicate with finite and restricted vocabulary sets, which will inevitably restrict the content and form of their communicative output. The omission of many syntactical elements and functors in the children's utterances may therefore have been partly, or even largely, due to the fact that the children did not have the required vocabulary items available to them. Finally, the slow rate of augmentative communication creates a need for efficiency in utterance productions. Thus many users might be reducing utterances to the least possible number of words, leaving out even those syntactic and stylistic elements which they have available and are able to use, but which are secondary to the message, in order to achieve a faster rate of message transmission. Yoder and Kraat (1983) argue along similar lines that to be successful with augmentative system use, users frequently need to break down conventional linguistic rule usage. In the recording sessions used in the present study, the children were given unlimited time (within the confines of the session itself) to produce as lengthy and elaborate sign and symbol utterances as they wished to and were able to. But it is not possible to determine whether the limited language structures that were produced, resulted from lack of ability to produce more complex utterances, or from the children's awareness of the need for speed and efficiency in utterance production. At most, it can be stated that the production of more syntactically complete messages is not always appropriate as a measure of successful sign and symbol use. It may be argued that there is no need for fully grammatical utterances, which are often slow and laborious to produce, as long as the meaning and communicative intent of the utterances is successfully conveyed. Analysis of the semantic and pragmatic aspects of the children's sign and symbol utterances bears directly on this issue, and as such will be described in Chapters 27.4 and 27.5.

27.3 'Word Order' in the Sign and Symbol Language Samples

It will be recalled that only 29.6% of the symbol utterances and 8.5% of the sign utterances produced were multi-term utterances. Nevertheless, it was considered worthwhile to determine the extent to which these reflected conventional English word ordering, compared with deviant orderings, particularly since several teachers and speech therapists have voiced their concern to the present writer about the difficulty of teaching their students to produce sign and symbol utterances in correct English word order. A few published reports of sign and symbol training have also included anecdotal comments about chaotic ordering in the children's expressive language samples (see Fenn and Rowe (1975) and Lambert (1978) on the use of PGSS by mentally handicapped cerebral palsied children and language disordered children. Also House, Hanley and Magid (1980) on the use of logographic symbols by mentally handicapped adults). In this regard it must again be stressed that the teachers typically taught Blissymbolics and BSL (Makaton) together with speech, and following English word order.

The multi-term utterances examined were restricted to statements using some combination of Subject, Verb and Object, or using a Determiner, Adjective and/or Preposition together with a Noun. The percentages of sign and symbol utterances demonstrating conventional English ordering are shown in Table 21. As can be seen, very few

Table 21: The Percentages of Sign and Symbol Utterances Demonstrating Conventional English Ordering

	Bliss Users		BSL (Makaton) Users	
	No. of Subjects	% utterances	No. of Subjects	% utterances
Subject + verb	8	100	2	100
Verb + object	1	0	0	-
Subject + object	4	62.5	2	100
Subject + verb + object	3	100	0	-
Determiner + noun	0	-	1	100
Adjective + noun	1	100	1	0
Preposition + noun	1	100	0	-
Determiner + adjective+ noun	0	-	0	-
Preposition + determiner + noun	0	-	0	-

subjects in each of the Bliss and BSL (Makaton) groups produced utterances using combinations of the above elements, and 2 structures were not produced at all - namely determiner + adjective + noun, and preposition + determiner + noun. But with the exception of the verb + object, subject + object and adjective + noun strings, all structures produced were in correct English word order. Only 1 Bliss User produced verb + object structures, and these were in incorrect order (i.e. object + verb). Interestingly, Brown (1973) and Bowerman (1978) found that word order in early spoken language samples generally corresponded to the dominant adult order, and that the most common exceptionally ordered strings involved placing the object before the verb. Four Bliss Users and 2 Makaton Signers produced subject + object utterances; of these only 37.5% of the Bliss Users' utterances, and none of the Signers' utterances, were in incorrect order. And 1 Bliss User and 1 Signer each produced 1 adjective + noun utterance, with the Signer's utterance being in inverted order.

In view of the above, it seems likely that teachers' concern in relation to the question of word order in fact stems from a difficulty in getting their students to produce multi-term utterances at all. The present data would suggest that when children <u>do</u> produce sign and symbol combinations, these are mostly in correct English word order. This preference for appropriate ordering is particularly reassuring when considered in the context of the minimal exposure to sign and symbol use and the few everyday models for such use that were available in the children's environments; although models for correct spoken word order were of course prevalent. These findings can also be used as evidence for the intention to express semantic relations, which will be examined in the next section. A cautionary note must however be introduced here, since the structures examined above were all <u>early</u> combinatorial strings. Dale (1977) found that the early combinatorial speech of Down's Syndrome and normal children followed similar patterns, but that when more sophisticated aspects of syntactical knowledge were examined, the Down's Syndrome children showed many incorrectly ordered utterances (eg. failing to invert the order of subject and copula or auxiliary verb in interrogative sentences). It remains to be seen whether similar difficulties characterize the more advanced utterances of sign and symbol users.

27.4 Semantic Relations Expressed in the Sign and Symbol Utterances

The children's 2-term sign and symbol utterances were classified according to the 8 semantic relations which have been found by Brown (1973) to characterize speaking children's early word combinations. Analysis according to these relations was felt to be appropriate since the average MSLU's of the Bliss and BSL (Makaton) groups placed them in Brown's first stage of language development (Stage I). The children's 3- and 4-term utterances were classified according to 6 further semantic relations which Brown, and MacDonald (1978), identified as the primary relations expressed in children's 3- and 4-word combinations. Table 22 presents the mean frequency with which

Table 22: Semantic Relations Expressed in the Sign and Symbol Utterances

	Bliss Users (n=15)		Makaton Users (n=3)		Diff.bet.Groups
	Mean No. of utt.s	% of tot.utt.s	Mean No. of utt.s	% of tot.utt.s	on % Frequency t
Two-term Relations					
Agent - action	0.73	5.40	2.67	13.67	2.11*
Action - object	0.07	0.53	0.67	4.33	0.87
Agent - object	0.40	3.07	0.33	1.00	0.59
Modifier - head	0.07	0.40	0.67	4.33	0.90
Negation - X	0.00	0.00	0.00	0.00	0.00
Action - location	0.33	2.40	0.00	0.00	0.98
Agent/object - location	0.40	2.53	1.00	5.33	0.93
Introducer - X	0.00	0.00	0.00	0.00	0.00
Other relations	1.87	11.27	1.33	6.33	0.86
Unclassifiable	0.13	0.53	0.00	0.00	0.62
% 2-term rels. classified	55.47	-	77.00	-	0.97
Three-term Relations					
Agent-action-object	0.00	0.00	0.00	0.00	0.00
Experiencer-state-source	0.47	2.60	0.00	0.00	0.77
Introducer-modifier-head	0.00	0.00	0.00	0.00	0.00
Agent-action-location	0.20	1.87	0.00	0.00	0.58
Action-modifier-head	0.00	0.00	0.00	0.00	0.00
Other relations	1.07	7.13	0.67	3.00	0.61
Unclassifiable	0.07	0.20	0.00	0.00	0.44
Four-term Relations					
Agent-action-obj.-loc.	0.00	0.00	0.00	0.00	0.00
Other relations	0.07	0.20	0.67	3.00	0.93
Unclassifiable	0.00	0.00	0.00	0.00	0.00

each semantic relation was expressed in the sign and symbol utterances, and the percentage of utterances (out of total utterances) which fitted these categories. Since only 15 Bliss Users and 3 Makaton Signers produced at least one multi-term utterance, the data are based on a much reduced sample size.

Comparing the Bliss and Makaton Users on the percentages of utterances classified according to these semantic categories, only one significant difference emerged. The Signers expressed significantly more agent-action relations in their utterances than did the Bliss Users. This accords with the earlier finding that the Signing group produced significantly more single verbs on the LARSP analysis, and again may be explained by the suggestion that action concepts were less meaningful for the Bliss Users since they were more physically handicapped than the Makaton Signers. The small number of subjects in the Signing group may well explain the absence of significant differences between the Bliss and Makaton Users on any of the other semantic relations expressed. Indeed, since only 3 Makaton Signers produced multi-term utterances, comparisons between the 2 groups are not really appropriate.

The set of 8 two-term semantic relations identified by Brown accounted for 56% of the two-term utterances produced by the 15 Bliss Users, and for 77% of the two-term utterances produced by the 3 Makaton Signers. These figures compare quite favourably with Brown's, and Retherford, Schwartz and Chapman's (1981), findings that approximately 64% to 70% of the two-word utterances produced by young normal speakers could be described with these 8 semantic relations. The figures suggest that nonverbal augmentative communication users express similar types of relational meanings in their early utterances to those expressed by normal speakers. Furthermore, the relative frequencies of the particular semantic relations used by the present subjects are very similar to those reported for younger normal speakers. Among the Bliss Users, the relations of agent-action, agent-object, action-location and agent/object-location occurred most frequently; action-object and modifier-head occurred much less frequently, while negation-X and introducer-X were not used at all (see Table 22). There were some differences in the pattern of use displayed by the 3 Makaton Signers, but again agent-action and agent/object-location were among the most frequently occurring semantic relations. Action-object and modifier-head relations were also expressed comparatively frequently by the 3 Signers, while agent-object occurred much less frequently. In addition to the absence of the negation-X and introducer-X relations, there were no instances of the action-location relation in the 2-term sign utterances. Obviously the 8 specified semantic relations did not account for <u>all</u> 2-term utterances, and there were quite a few utterances in each group which were not counted among the prevalent semantic relations, for example utterances involving naming of present objects, time and classification. However, as can be seen in Table 22, very few of all multi-term utterances were semantically uninterpretable.

Overall, these results accord well with the claim made by Bloom (1970) and Brown (1973) that the 3 semantic concepts of agent, action and object dominate children's early language productions. This finding is of particular interest since it would seem to indicate that the early sign and symbol combinations of nonverbal physically handicapped children are action-oriented, in much the same way as is the early language of speaking children. The data are also broadly in agreement with the findings of Florance (in MacDonald, 1978) on the relative frequency of occurrence of 2-term semantic relations in the speech samples of normal children aged 13 to 57 months, and with MLUs from 2.00 to 4.00 words. Florance found that agent-action, action-object, agent-object and modifier-head relations occurred most frequently in the samples, while negation-X, introducer-X and X-location occurred much less frequently. The comparatively greater frequency with which relations involving location were expressed by the present subjects may well be due to the different settings in which language samples were gathered in the 2 studies. Florance recorded samples as the children were interacting with peers, while in the present study one of the main activities engaged in by the children was looking at picture books. This task is more likely to elicit the use of locative phrases, since it incorporates a variety of actors and activities in different locations. However, it is worth noting that Brown (1973), too, found strong evidence for the presence of action/agent/object-location relations in his data. The other main difference with Florance's findings concerns the negation-X and introducer-X relations; these were used to some extent by Florance's subjects, but not at all in the present sample. The absence of sign and symbol utterances expressing negation was pointed out earlier, in relation to the LARSP analysis, and can be partly accounted for by the children's tendency to use gesture and facial expression to indicate the negative, rather than a sign or symbol. The use of the introducer relation requires specific vocabulary items (this, that, it, a, the) which were not available to most of the sign and symbol users. The limited use of the modifier-head relation by the Bliss group may also be accounted for by the poverty of their symbol vocabulary. These differences aside, however, it seems that despite the differences in the language modalities and in the characteristics of the children themselves, they were able to express the majority of 2-term semantic relations that have been found in other studies to dominate younger children's early spoken word combinations. They communicated about the ways in which different agents and objects relate to one another through actions, and about the locations of objects and actions, just as normal children do (Bloom, Lightbown and Hood, 1975; Bowerman, 1976; Brown, 1973). Of course the relatively few multi-term utterances produced by the Bliss and Makaton Users overall, meant that while the semantic relations expressed did not differ qualitatively from those of younger speaking children with roughly equivalent MLUs, they did differ quantitatively.

Turning to consider the children's 3- and 4-term symbol and sign utterances, it can be seen in Table 22 that most of these were classified as expressing 'other' semantic relations rather than any of the specified 3- and 4-term relations which are the primary relations expressed by speaking children. However, very few utterances of these lengths were produced at all, and it is therefore unwise to draw any conclusions on augmentative system users' 3- and 4-term utterances on the basis of such a small sample of data.

In the only other study to have examined the semantic relations expressed in the symbol combinations of severely language handicapped children, Light (1985) also found that most of the children's Bliss utterances expressed concepts of object, location, action, entity and agent. Negation, attribution, recurrence and demonstrative were almost never expressed. The few sign training studies which provide data on this issue also confirm the present findings that sign users make use of much the same range of relational meanings as younger speaking children. Bonvillian and Nelson (1976) and Layton and Baker (1981) presented semantic analyses of the early utterances produced by 2 autistic children who were learning sign language. As in the present study, they found evidence for most of the above semantic relations. The majority of the children's recorded utterances involved the action relation (eg. agent-action), and other constructions found included action-location and possessor-object (i.e. modifier-head) relations. Fenn and Rowe (1975), too, reported the use of all Brown's semantic relations by a number of mentally handicapped cerebral palsied children learning PGSS. Interestingly, similar findings have been reported for language-delayed and mentally handicapped children using speech. They, too, have been shown to express the same set of semantic relations as normal speakers matched for MLU (Coggins, 1979; Freedman and Carpenter, 1976). However, Bonvillian and Nelson (1978) and Layton and Baker (1981) do introduce a cautionary note. They followed their students up over 1½ to 2½ years, and found that their subsequent sign combinations did not keep pace with those of normal children, and most remained 2 or 3 signs in length. It is also important to remember that 85% of the Sign Users and 25% of the Bliss Users produced no multi-term utterances at all, and their samples were thus not included in the present analysis.

The general conclusion to be drawn from this discussion is that when augmentative communication users do begin to produce sign and symbol combinations, they make use of the same range of semantic features as younger speaking children. This is rather surprising when one considers that these children do not acquire signs and symbols naturally, as a first language, but are instead taught the systems in formal, time-limited teaching sessions. Other differences between the Bliss and BSL (Makaton) Users and normal speakers that are relevant in this regard concern differences in cognitive level, chronological age and physical skills, differences in the expressive modalities themselves, the absence of everyday models of sign and symbol use, and the vocabulary limitations of the children's sign and symbol repertoires, which inevitably impose constraints on what is possible in a communicative interaction. The parallels that have been found with younger normal speakers - in spite of the differences just described - may be partly explained in terms of teaching methods. It is possible that the semantic concepts are the basic elements taught in many of the teaching programmes. It is known that a number of the speech therapists in the present study used the Derbyshire Language Scheme in teaching, a programme which is semantically based. Alternatively, this universality of the semantic relations expressed may reflect the initial stages of acquisition of communicative skills in any mode. In this regard, Brown (1973), Bowerman (1973) and Slobin (1970) have all suggested that similarities among children in the acquisition of meaning result from the way in which the underlying cognitive structures provide children with the necessary knowledge to organize their experience with people, objects and events. At any rate, it is reassuring to find that the children's sign and symbol vocabularies, although limited in size, were sufficiently diverse to allow for the expression of such varied meanings.

27.5 Communicative Functions Expressed

The children's symbol and sign utterances were analyzed according to the communicative function intended by each utterance, using Dore's (1977, 1979) model of conversational acts. Definitions and reliabilities of these conversational act categories are presented in Chapter 19.3.3.2 and Appendix 10. The frequency and percentage of occurrence of each act (out of the total number of utterances) is presented in Appendix 21, and a summary of these data is given in Table 23. Comparisons of the communicative intents expressed by the Bliss and

Table 23: Summary of the Communicative Functions Expressed in the Sign and Symbol Utterances - Percentage of Total Utterances in Each Category

Communicative Function	Bliss Users (n = 20) % of tot.utt.s	Makaton Users (n = 15) % of tot. utt.s	t	Dore's Normal Speakers (n=7) % of tot. utt.s
Requests	12.60	10.13	0.33	27.00
Responses	57.95	49.53	0.92	18.50
Descriptions	23.85	31.40	1.09	22.30
Statements	2.75	7.00	0.63	13.80
Organization Devices	0.30	0.00	0.86	5.80
Performatives	0.00	0.00	0.00	10.80
Other Functions	0.00	0.00	0.00	-
Uninterpretable	1.65	2.07	0.34	7.90

BSL (Makaton) Users revealed only 1 significant difference between the 2 groups; the Signers were found to use significantly more utterances expressing identifications (labelling of objects, persons and events) than the Bliss Users. The Signers' relatively poorer cognitive and language comprehension skills may help to account for the greater frequency with which they expressed this simple labelling function. However, this difference aside, the 2 groups showed broadly similar patterns of use of the communicative functions.

Examination of these communicative functions reveals examples of the use of symbols and signs to make requests, to answer questions, to describe actions, events and locations, to express feelings, and to label objects, people and events. Very few of the utterances in either the Bliss or Makaton groups were uninterpretable. However, a closer look at the percentage of occurrence of the various functions shows considerable restriction in the number of different communicative intentions that were expressed with any degree of frequency. Although 15 different functions (out of a total of 30) were used at least once, 86% of all symbol utterances and 89% of all sign utterances could be accounted for in terms of just 4 communicative functions. These were responses to Wh-questions, labelling, action requests, and description of events. Responses were by far the most frequent function expressed, with approximately half of all sign and symbol utterances being solicited in response to a Wh-question. A further 9% of symbol utterances and 23% of sign utterances expressed a labelling function; 11% of symbol utterances and 9% of sign utterances were action requests, and 10% of symbol utterances and 6% of sign utterances were descriptions of events. Eleven other communicative functions were expressed very infrequently; these included spontaneous questions, yes/no answers, descriptions of properties, locations and times, reports of feeling states, and attributions. There were also some significant gaps in the children's communicative skills, with many categories not being used at all, for example organization devices, performatives, permission requests, evaluations and rules.

A number of sign training studies include anecdotal reports which accord with the present findings that signs and symbols are used by students for labelling, to describe actions and locations, to request actions, and to express feeling states (eg. Konstantareas, Webster and Oxman, 1979; Miller and Miller, 1973; Schaeffer, 1982). However, Konstantareas et al. also pointed out that not all children employed all these functions, and that labelling and making requests were the most common spontaneous (i.e. non-response) functions expressed. This pattern is identical to that found here. Systematic analyses in terms of pragmatics are rare, but the few relevant studies which have examined the variety and types of speech acts produced by augmentative system users (all studies of symbol use) provide even stronger confirmation for the present results. They too have found that many communicative acts are absent from the children's language samples, and that there is a very high proportion of information giving in response to limited-response questions (Calculator and Dollaghan, 1982; Harris, 1982; Lewis and Ripich, 1984; Light, 1985). Light, for example, found that the most common functions expressed by 8 4- to 6-year-old Bliss Users were confirmations and denials, followed by responses to caregivers' requests. None of the children requested information, and only 1 child requested clarification and expressed greetings or other social conventions.

The present subjects' deficiencies in the range of conversational acts employed become particularly apparent when the results are compared with those presented by Dore (1977) for 3-year-old normal speakers (see Table 23). Dore's subjects expressed 32 different communicative functions in their utterances, whereas the present subjects only expressed 15 types of communicative acts. Furthermore, as can be seen in Table 23, the younger normal speakers expressed proportionally fewer responses, and more spontaneous questions and statements, when compared with the Bliss and BSL (Makaton) Users. Dore's subjects also used a fair proportion of organization devices and performatives in their speech, whereas these acts were almost completely absent from the sign and symbol language samples. It must be recognized that the settings in which Dore's language samples were gathered (peer interactions) differed from the settings used to gather expressive language samples in the present study. The present results were obtained in semi-structured sessions in which the children were seen by the examiner on their own and encouraged to communicate about a set of toys, picture books and general interest topics; it is therefore not clear to what extent the results are generalizable. It is well known that participant, setting and task differences influence the kinds of conversational acts children express (Cole, Dore, Hall and Dowley, 1978). The use of picture books, for example, may have encouraged the children to express more descriptions than they might express in other settings. It would also be difficult to dismiss the possibility that the investigator's occasional questions affected the content and function of the children's sampled language. This may account, at least in part, for the higher frequency of responses found in the present samples, when compared with Dore's results. On the other hand, the present findings agree very closely with those reported in the few studies where augmentative system users have been observed in naturalistic classroom settings (Calculator and Dollaghan, 1982; Harris, 1982).

It can be concluded that although the present Bliss and Makaton Users made use of the same set of relational meanings (at least in their 2-term utterances) as do younger normal speakers (see Chapter 27.4), and although they were able to communicate <u>certain</u> conversational acts effectively, they showed significant deficits in comparison with younger normal children in terms of the range and frequency of communicative functions that they were able to express.

As already discussed, these findings are likely to be due to a variety of factors, including the passivity and lack of initiation that characterize many nonverbal individuals, the limitations of the augmentative communication systems themselves, and the nature of adults' responses to the system users. The limited physical, cognitive and linguistic experiences of many of the children, and their well-established patterns of passivity and non-communication, obviously affect the quality and quantity of their interactions, and can help to explain the low frequency with which they initiated requests and other communicative intents. Harris (1982) has further noted that, in general, physically handicapped nonverbal individuals are not afforded the opportunity to express language functions other than responses, since most of their needs are provided for or guessed. The greatly reduced rate of expression, particularly in Bliss but also in signing, is another deterrent to the use of some types of communicative functions. Responding to questions can be accomplished relatively quickly by the child, since in these cases the context and background information relevant to the interaction have already been provided by the vocal speaker. But expression of other communicative functions (eg. questions, descriptions, statements) takes more time and effort for the system user since he/she is required to provide more information for the message receiver, and this may discourage the child. The slow rate of communication also means that while essential needs and desires are likely to be communicated (in the form of action requests), less salient aspects of communication, and particularly performatives and organizational devices, will not be expressed (Yoder and Kraat, 1983). In other situations gestures, vocalizations or facial expressions may be used instead of signs or symbols to effect speedy communication. This is likely to account for the low frequency of yes/no answers found in the present sample; in most cases this function was expressed by a non-system mode (eg. head shakes), since this was quicker than symbol indication or signing. The types of communicative acts addressed to the system user by vocal speakers are also important. Often the user is barraged with questions that require a 1-word answer, or statements that do not require participation from the user (Harris, 1982; Yoder and Kraat, 1983). This stems from the vocal person's need to speed up interactions, and means that many system users get little practice in initiating communication or expressing communicative functions other than responses. It is also important to bear in mind that augmentative system users are limited in the diversity of communicative functions they can express by the number and variety of vocabulary items available to them. As Kraat (1984) points out, an array of symbols representing only objects and actions will obviously have limited and skewed communicative possibilities. Forms of expression involving wh-questions, permission requests, descriptions of locations and times, expression of feelings, and organization devices, may thus have been unavailable to the Bliss and Makaton Users simply because they did not have the requisite signs or symbols to express such functions.

A final explanation for the limited range of communicative functions expressed by the children may relate to the teaching methods used. While it is recognized that the children had only been in sign and symbol training programmes for an average of 10 months prior to commencement of the study, the present findings would seem to suggest that even at this early stage training regimes need to focus more closely on the goal of varied use of vocabulary items, rather than on simple labelling routines; and that teachers and parents need to adopt more sophisticated teaching methods than those which are currently used in order to help children to become more active participants in communicative settings. Training and use of the systems need to be extended beyond the confines of formal sessions. The automatic provision of all the child's needs and wishes, even before these are requested, must be discouraged. Further, children need to be given the relevant vocabulary items (i.e. the means) to express a variety of functions, such as questions, feeling states, ideas and descriptions of various kinds. They need to be taught how to use them by example, and they need to be given encouragement, time and opportunities to express these functions in situations where they are meaningful and rewarding (Bloom and Lahey, 1978). As an example, Kiernan and Reid (1984) point to the work of Carr and Dores (1981), which showed that autistic children who used signs only when they were elicited, could learn to use them spontaneously when taught to employ signs as requests for actions or services.

27.6 Summary of the Findings on the Syntactic, Semantic and Pragmatic Analyses of the Children's Expressive Language Samples

The present findings show extremely poor conversational use of Blissymbols and BSL (Makaton) signs, with very few utterances being produced during the half-hour recording sessions, and these being mostly 1 sign or symbol in length. A quarter of the children exposed to sign training produced no utterances at all during the recording sessions, and for the remaining children only 29.5% of Bliss utterances and 8.5% of sign utterances consisted of more than 1 symbol or sign. Approximately half of the children's utterances were spontaneous initiations, and half were responses to the adult's questions, commands or statements. Syntactic analysis of the symbol and sign language samples reinforced this picture, showing that the children produced mostly single-term LARSP structures (almost all of these being nouns or verbs), with a few 2- and 3-term clause and phrase structures being used. Complex sentence structures were not produced at all. In addition to the picture of general language delay suggested by the

LARSP profile, there were also some noticeable gaps in syntactic ability - certain early structures such as negatives, commands, questions and adjectives, were rarely or never used. Interestingly, the few utterances which did involve sign and symbol combinations mostly reflected conventional English word ordering.

Semantic analysis of the children's 2-term sign and symbol utterances showed that, despite the problems in using English syntactic structures, the children expressed similar types of relational meanings in their early utterances to those expressed by younger normal children with similar MLUs. The 3 semantic concepts of agent, action and object dominated the 2-sign/symbol utterances of these physically handicapped cerebral palsied children, in much the same way as they dominate speaking children's early language productions. On the other hand, the small number of multi-term utterances produced by the sample overall, resulted in large quantitative differences in the frequency with which these relations were produced. Moreover, none of the 3- and 4-term semantic relations typically expressed by normal speakers were found in the present sample. Finally, examination of the communicative functions expressed by the Sign and Symbol Users revealed severe restrictions in the number of different communicative functions that were produced. Approximately half of the sign and symbol utterances were responses to Wh-questions, and over 85% of all utterances could be accounted for in terms of just 4 communicative functions. Again, there were significant gaps in the children's communicative skills, with many functions not being used at all.

These findings suggest that sign and symbol communication samples are quantitatively very different from spoken communication samples, but that in addition there are some important qualitative differences in the way augmentative system users communicate, particularly as far as syntactic and pragmatic features are concerned. Past augmentative communication research studies focused almost exclusively on the assessment of sign and symbol vocabulary acquisition. Recently, however, a few studies have begun to give attention to semantic and pragmatic aspects of sign/symbol use, and they tend to confirm the present findings. Possible factors which may help to account for these findings were discussed in the body of the chapter, as were the implications of the results for augmentative communication training.

Very few differences between the Bliss and BSL (Makaton) groups were found on these measures, and those that were significant were mostly related to the Bliss Users producing utterances of significantly greater length than the Makaton Signers. The absence of a greater number of significant differences between the 2 groups is surprising, bearing in mind that the Bliss Users achieved higher scores on the cognitive and language comprehension measures used in the study, but it can probably be accounted for by the fact that both groups produced relatively few utterances, which were mostly 1 sign/symbol in length. Furthermore, the few significant differences that were found between the 2 groups disappeared when the group differences in IQ, language comprehension and severity of physical handicap were controlled for, suggesting that neither augmentative mode facilitated greater communicative use than the other, at least in the early stages of training and in the kinds of recording sessions employed in this study.

Chapter 28. Intercorrelations Among the Measures Derived from Syntactic, Semantic and Pragmatic Analyses of the Symbol and Sign Language Samples

Intercorrelations among the measures of syntactic ability (including MSLU and LARSP summary measures), the semantic relations and the communicative functions expressed in the children's language samples, were computed for each of the Bliss and BSL (Makaton) groups. The resulting correlation matrices are presented in Appendix 22. It should be noted that a number of measures were not included in the analysis (for example, the semantic relations of negation-X and introducer-X, and the pragmatic function of performatives) because no entries were produced in these categories.

In the BSL (Makaton) group, the number of signs the children had learned to execute and to understand were significantly correlated with the number of utterances they produced during the half-hour recording session, with the length and complexity of these utterances (as given by the measure of MSLU and by the LARSP summary measures), and with the frequency with which they produced the pragmatic functions of responses and descriptions. These findings indicate that the more signs the children had acquired, the more likely they were to use these signs to produce utterances of greater number and length in the semi-structured conversational settings. It must be remembered that only 3 Signers produced 2- and 3-term semantic relations, and that very few used the communicative functions of statements, requests and organization devices. The absence of significant correlations between the number of signs acquired and these latter measures is therefore to be expected. Fewer significant correlations emerged in the Bliss group.

The numbers of symbols understood and produced correlated significantly with 3 syntactic measures of sentence complexity, and the correlations with MSLU and number of multi-term utterances were just short of significance. Again, these results suggest that those children who had learned more symbols were also likely to use them to produce longer symbol combinations, which were more complex syntactically. On the other hand, the number of symbols acquired was not related to any of the measures of semantics and pragmatics. The reasons for this are not clear but may be related to the relatively small numbers of multi-term utterances involved. Alternatively, it may be hypothesized that the Bliss Users, who had higher cognitive, language comprehension and representational skills, were able to use greater ingenuity in expressing communicative functions and semantic relations, without being so restricted by the limited number of symbols available. In other words, the symbols they did have available may have been flexible enough to be used to express a range of different meanings and functions. Whatever the reason, the number of functions and relations the children were able to express was independent of the number of symbols they had acquired. This would suggest that simply teaching such children large numbers of vocabulary items may be important for syntactic production but is no way to guarantee communicative use of the items. As was argued earlier, varied and spontaneous use of augmentative communication may well need to be actively programmed.

Turning to consider the syntactic measures that were derived, high and significant correlations were found in both groups among the measures of utterance length, MSLU, total utterances, and LARSP clause and phrase structures. The only exceptions to this were the absence of significant correlations between the number of response utterances and 1-sign/symbol utterances produced, and the other syntactical measures. Since most response utterances were only 1 sign/symbol long, and since the 1-sign/symbol utterance measure, by its definition, precluded a score on any of the measures of complex structure, the explanation for these findings is self-evident. The significant correlations (ranging from 0.40 to 0.99) which were found between the measures of mean sign/symbol length of utterance (MSLU) and the other measures of syntactic complexity, including those derived from the LARSP, are of particular interest because they confirm the value of the MSLU measure as a sensitive index of grammatical development. Brown (1973) developed the notion of mean morpheme length of utterance (MMLU) as an indicator of the level of linguistic development in young children's speech, and many writers have since confirmed his finding of high correlations between MLU and complexity of grammatical constructions (eg. De Villiers and De Villers, 1978 ; Udwin and Yule, 1982b; Wells, 1979). However, MLU was developed, and has been used, as a guide to the level of linguistic development in children using speech, and its relevance to language expression in other modes was not known. The present results constitute the first confirmation of the usefulness of this measure as an index of syntactic development in samples of sign and symbol utterances.

The relationship between the measures of syntactic complexity (including MSLU) and the frequency with which 2- and 3-term semantic relations were produced could not be examined in the BSL (Makaton) group, since only 3 Signers produced sign combinations. In the Bliss group a few of these correlations were found to be significant, and they tended to reflect the common factor of utterance length (for example the correlations between numbers of clauses and phrases at Stage III and the 3-term semantic relations). Many more significant correlations were found, in both groups, between the syntactic measures and the pragmatic measures; however, there were also many non-significant correlations, and the patterns of significant correlations were not at all clear cut. Over both groups, the categories of requests, responses, descriptions and statement correlated significantly with the total number of utterances and total number of spontaneous utterances produced, indicating that the children who were producing the most utterances, were expressing a range of communicative functions, rather than producing many utterances all of 1 type. Utterances which expressed responses and descriptions (labelling) were highly correlated with the number of single-term utterances produced, that is they were more likely to be 1 sign/symbol long; whereas statements tended to be 2 or 3 signs/symbols long. These findings would imply that presenting these children with questions in the hope of encouraging their expressive use of augmentative communication modes, is likely to elicit restricted language output. It is more valuable to give children the encouragement and the opportunity to express statement functions, such as reports of feeling states and evaluations (i.e. feelings and ideas), because these are more likely to produce longer and more complex utterances. On the whole, however, the results show that the augmentative system users' abilities to express these pragmatic functions, and 2- and 3-term semantic relations, are not clearly related to their degree of command of English syntactic structures. As Wells (1979) found in the case of a group of 3-year-old normal speakers, there seems to be a degree of independence between form and function, at least at this early stage of expressive language development. This suggests that command of language, whether it be speech or an augmentative mode, is a complex of abilities, and that no one measure can give an accurate picture of an individual. One other factor that may help to explain this relative independence of function from form in the present sample relates to the slow rate of sign and symbol transmission. To be successful with the use of an augmentative system the user often has to break down conventional linguistic rule usage, for example by using telegraphic utterances, in order to achieve speed and efficiency in utterance production (Yoder and Kraat, 1983).

Chapter 29. The Relationship Between Symbol/Sign Acquisition and Use, and the Language Tests, Cognitive and Teaching Variables, and Severity of Physical Handicap

Correlational procedures were employed to examine the factors related to the acquisition of signs and symbols at baseline, and their use in the semi-structured conversational sessions. The resulting correlation matrices are presented in Appendix 23. In both the Bliss and BSL (Makaton) groups, the numbers of symbols/signs acquired at the receptive and expressive levels were related to the following measures: the Columbia Interlevel scores, the Frostig Visual Perception sub-tests, comprehension of gestures, the length of time the children had been learning the systems, and the extent of exposure to the systems during the course of the school day. In addition, the acquisition of signs correlated negatively with severity of handicap, and positively with motor imitation, gestural expression and symbolic play skills. These tasks all involve motor ability and spatial and representational skills, which are thus shown to be relevant to sign acquisition. In contrast, the acquisition of symbols did not relate to physical status, but correlated with the Pre-symbol Assessment task (involving symbol matching and pictorial identification), and the Reynell Comprehension Scale. The results thus suggest that both sign and symbol learning involve cognitive, perceptual and representational factors, and that in addition, and as expected, physical status, motor imitation skills and use of gesture are important for the acquisition of signs but not symbols.

Many fewer significant correlations were found with the syntactic, semantic and pragmatic measures of sign and symbol use, and the picture here is far less clear cut. This may be at least partly due to the small numbers of utterances produced by the children. In both groups, performance on the Columbia MMS, the Frostig Position in Space subtest and the Pre-symbol Assessment correlated significantly with a few of the syntactic measures of sentence length and complexity (including MSLU and, in a negative direction, with the percentage of LARSP entries at Stage I out of entries at Stages I - V). In the Makaton Signing group, the syntactic measures also correlated with the motor imitation and gestural expression and comprehension tasks, thereby again suggesting the importance of motor and representational skills, as well as of cognitive and perceptual abilities, for sign use. However, the syntactic measures also correlated with verbal and motor imitation and with the Reynell Expression Scale in the Bliss group. This finding is not easily explained. It would appear that those Bliss Users who had better expressive speech skills were able to use more English syntactic structures to produce longer and more complex symbol combinations. There were almost no significant correlations with the 2- and 3-term semantic relations expressed. In this regard, it is important to remember that very few of the Bliss Users, and more particularly of the BSL (Makaton) Users, produced multi-term utterances. Correlations with the communicative functions expressed in the sign and symbol utterances again suggested a rather confusing picture, with a number of significant correlations in each group but no consistent pattern of relationships.

The conclusions that can be drawn from these results are limited. They reveal no factors that were consistently related to the semantic relations or pragmatic functions expressed in the sign and symbol utterances, at least at this early stage in the children's exposure to Blissymbols and Makaton Signing. There were, however, some indications of correlates of sign/symbol acquisition and syntactic level of use. In both the Bliss and BSL (Makaton) groups, these measures were significantly correlated with IQ and with measures of perceptual and representational skills. In this regard it is important to bear in mind that the Columbia MMS, the Frostig test, the Pre-symbol Assessment and use of gesture all involve aspects of visuo-spatial orientation, matching and recognition of shape patterns, and the ability to comprehend the representation of a picture or concept by a symbol or gesture. All these skills are thus related to sign and symbol acquisition and use. The correlations between the Pre-symbol Assessment task and measures of sign, as well as of symbol, acquisition and use are particularly noteworthy. This task was developed by the Blissymbolics Communication Resource Centre (U.K.) to assess children's response to symbols, that is to help determine whether the teaching of a symbol system would be appropriate for a given individual. The present findings confirm that performance on this task is indeed related to Blissymbol acquisition and use at this early stage, but is also correlated with performance on BSL (Makaton) signs. Thus the Pre-symbol Assessment may not be of help for the differential selection of systems. In the Signing group, acquisition and use of signs was also correlated with measures of motor ability and motor imitation. In the Bliss group the measures further correlated with verbal imitation, with the Reynell Comprehension Scale, and more particularly with the Reynell Expression Scale. As already noted, since these children all had limited or no speech, there is no ready explanation for this latter finding. It may indicate that in this higher cognitive ability group, the severity of the developmental nonspeech condition (in the form of lack of productive experiences with spoken language and lack of auditory-vocal feedback) had an effect in depressing expressive language development even in a nonspeech mode. Whereas in less intellectually able children (viz. the Makaton Signers) productive spoken language expression may be less relevant to augmentative system use than is cognitive ability more generally. Whatever the reason, these findings certainly lend support to the Reynell Scales as useful instruments for the assessment of language competence in Blissymbolics.

Few significant correlations were found with chronological age, or with severity of physical handicap. This would suggest that gross physical skills are not in themselves essential for the development of representational skills or sign and symbol language expression (see Chapter 22.3 for a discussion of this point). However, the range of physical handicap was also rather limited, particularly in the Bliss group, which may be another reason for the absence of significant correlations between severity of handicap and sign and symbol use. Interestingly, the teaching variables (length of time on the system and extent of use at school) were significantly correlated with the number of symbols and signs acquired by the children, but with few other measures of system use. This may suggest that the response to an augmentative communication system, at least in the early months after its introduction, may be more closely related to certain subject characteristics than to the teaching input that is given. On the other hand, it must be remembered that in both groups the range of teaching input and exposure to the systems was very limited (see

Chapter 24). It would thus be premature to undervalue the role of environmental factors in fostering sign and symbol use. Teaching variables may be found to have greater impact when longer-term progress in the systems is examined; this question will be returned to in a later chapter.

The research literature to date is very inadequate in casting light on correlates of successful sign and symbol use; but the few studies which have taken individual differences into account provide confirmation for the present findings. As found in the present study, length of participation in augmentative training programmes has been shown by other researchers to correlate with the number of signs/ symbols acquired (eg. Bonvillian and Nelson, 1978; Daniloff and Shafer, 1981; Kiernan, Reid and Jones, 1982). Those studies which, like the present one, have included a wide range of IQ scores, have also found a relationship between IQ and the acquisition of signs and symbols, and their use in combination (eg. Grinnell, Detamore and Lippke, 1976; Saya, 1980; Silverman, McNaughton and Kates, 1978; Sutherland and Beckett,1969). A number of studies have further found tested language comprehension to be a good predictor of augmentative system acquisition and use (Deich and Hodges, 1982; Hobson and Duncan, 1979; Layton and Helmer, 1982; Reid, 1984; Remington, Light and Porter, 1981). In the present study, significant correlations were found between Reynell Comprehension and Expression scores and the acquisition and syntactic use of symbols; fewer significant correlations were found in the BSL (Makaton) group, but a number of the coefficients were close to significance. Interestingly, this also parallels the findings in groups of speaking children of correlations between the Reynell Scales and measures of grammatical development in spoken language samples (Cantwell, Howlin and Rutter, 1977; Udwin and Yule, 1982b).

The present finding of an association between the use of gesture and motor imitation and sign acquisition and use is also borne out in other reports (eg. Kahn, 1981; Reid and Kiernan, 1984). These tasks require coordinated motor acts and spatial orientation skills. The manually produced and visually observed elements of sign and gesture obviously have much in common. However, the present findings of the importance of imitation, and of the comprehension and use of gesture, not only for sign use but also for symbol use, would also seem to underline the relevance of representational abilities for augmentative communication. Indeed, Piaget (1967), Sinclair (1970) and other writers have argued that the child's idiosyncratic symbol system, manifested for example in imitation, use of gesture and symbolic play, is a precursor of the shared symbolic function of language. The development of gesture, imitation and representational play have thus also been found to be closely related to language development in normal speaking children (Bates, 1976; Rosenblatt, 1977) and in mentally handicapped and language disordered children (Lovell, Hoyle and Siddall, 1968; Udwin and Yule, 1983). On the other hand, few significant correlations were found in the present study between the measure of symbolic play and sign acquisition and use, and none with symbol acquisition and use. These discrepancies may be explained by the limited range of symbolic play test scores that were obtained. This test was designed for children under 3 years of age, and many of the Bliss Users, in particular, tended to score in a narrow range near (although not at) the ceiling of the test.

The finding that motor imitation and comprehension of gestures correlated significantly not only with the measures of sign acquisition and syntactic use, but also with many of the measures of symbol acquisition and syntax, is of particular significance. A number of writers have suggested that where nonspeaking children respond well to gestures and have good motor imitation skills, these factors would favour the adoption of a sign system for the child (eg. Bonvillian and Nelson, 1982; Shane, 1981). However the present findings indicate that these skills are just as relevant for the use of symbols! At this early stage, only actual use of gesture would seem to be related to good performance in signing, but not to symbol communication.

It will be recalled that the survey conducted by Kiernan, Reid and Jones (1982) indicated that differential placement in augmentative communication programmes occurs in schools primarily on the basis of 2 factors - physical ability and cognitive level. This was confirmed in the present study. Blissymbolics is seen as appropriate for severely physically handicapped children who are more capable intellectually, whereas BSL (Makaton) is seen as more appropriate for severely mentally handicapped children who tend not to be very severely physically handicapped. The correlational data discussed above confirm the relevance of adequate physical skills for the acquisition of signs, and indicate that cognitive level is related to the acquisition and use of both sign and symbol systems. But they also suggest that other factors need to be taken into account in system selection, including perceptual and representational abilities, the use of gesture, and imitation skills. The possible role of these factors in differentially predicting longer term progress in sign and symbol use, and the contribution of other factors such as attending ability and parents' attitude to the systems, will be elaborated upon in later chapters.

One additional question that will be addressed here concerns the practice prevalent in many schools in the U.K. of excluding low cognitive ability children from Bliss programmes because of the belief that such children would be unable to cope with the system (Kiernan, Reid and Jones, 1982). As already discussed, cognitive level has been found in this study to be related to the acquisition and use of both symbols and signs. But clearly this need not mean that severely and profoundly mentally handiapped children are unable to acquire any symbols or signs at all. It was therefore considered to be important to examine the performance of the severely and profoundly mentally handicapped children in the present sample in sign/symbol acquisition and use, even at this early stage of exposure to the systems.

To this end, each of the Bliss and BSL (Makaton) groups was further subdivided into 2 groups - a severely/profoundly mentally handicapped group, consisting of those children with Columbia IQs of 55 or below (to be called the 'low-IQ' group); and a moderately mentally handicapped to average IQ group, consisting of children with IQs above 55 (referred to as the 'higher-IQ' group). Among the Bliss Users, there were only 4 children in the 'low-IQ' group, and 16 in the 'higher-IQ' group. There was a more even split among the Makaton Signers, with 11 children in the 'low-IQ' group and 9 in the 'higher-IQ' group. Table 24.1 shows the mean scores and standard deviations of the 'low-' and 'higher-IQ' Bliss and BSL (Makaton) Users on the measures of symbol/sign acquisition and syntactic and pragmatic use. The semantic relations variables were not included here, because of the extremely small numbers of multi-term utterances involved. Table 24.2 presents the results of 2-way analyses of variance for these measures, providing statistical tests for differences due to the main effects of Bliss/Makaton Group and IQ, and their interaction Group x IQ.. Since differences between the Bliss and BSL (Makaton) groups on these measures have already been described in earlier chapters, the present discussion will be confined to an examination of the IQ and interaction effects.

It must be pointed out that while all 20 Bliss Users (i.e. including the 4 'low-IQ' subjects) and all 9 'higher-IQ' Makaton Signers produced at least 1 utterance during the half-hour recording session, only 6 of the 11 'low-IQ' Signers did so. The data on the syntactic and pragmatic measures are thus based on only 6 'low-IQ' Signers.

Table 24.1: Mean Scores for Acquisition and Use of Symbols/Signs in the 'Low-' and 'Higher-IQ' Bliss and Makaton Groups

	Bliss Group		Makaton Group	
	Low-IQ (n = 4)	Higher-IQ (n = 16)	Low IQ (n = 11)	Higher-IQ (n = 9)
Symbols/signs taught	54.5±18.3	72.4±62.4	41.2±34.4	89.3±23.9
% symbols/signs understood	71.8±12.5	69.7±25.4	45.8±29.7	50.1±31.6
% symbols/signs produced	66.8±10.8	79.2±17.4	31.7±23.6	50.4±22.4
Total utterances	9.7± 2.5	13.6±10.6	3.3± 3.0	16.3±10.1
% spontaneous utterances	37.3±12.0	41.9±17.2	47.2±45.3	50.4±21.8
% response utterances	62.8±12.0	58.1±17.2	52.8±45.3	49.6±21.8
1-term utterances	8.0± 2.8	8.3± 7.6	3.3± 3.0	13.6± 9.8
Multi-term utterances	1.8± 1.0	5.3± 5.5	0.0± 0.0	2.8± 4.9
% Stage I entries out of entries at Stages I-V	77.8±16.1	63.6±30.0	100.0± 0.0	81.3±28.7
Stage II clauses	1.3± 1.0	2.4± 2.7	0.0± 0.0	1.7± 2.7
Stage II phrases	0.5± 0.6	1.8± 2.8	0.0± 0.0	0.7± 1.4
Stage III clauses	0.0± 0.0	1.4± 2.1	0.0± 0.0	0.0± 0.0
Stage III phrases	0.3± 0.5	1.7± 2.9	0.0± 0.0	2.2± 2.2
Stage IV clauses	0.0± 0.0	0.1± 0.3	0.0± 0.0	0.0± 0.0
Stage IV phrases	0.0± 0.0	0.1± 0.3	0.0± 0.0	0.2± 0.7
Requests	1.5± 1.9	1.6± 2.4	0.3± 0.5	0.9± 1.4
Responses	5.8± 2.1	7.4± 6.0	2.0± 2.3	6.8± 4.3
Descriptions	2.0± 1.8	3.7± 4.6	0.7± 1.2	8.0± 7.7
Statements	0.0± 0.0	0.6± 0.9	0.2± 0.4	0.1± 0.3
Organization devices	0.0± 0.0	0.1± 0.3	0.0± 0.0	0.0± 0.0
Months on Bliss/Makaton pre study	13.3± 3.3	10.3± 5.9	7.8± 5.9	13.6± 3.1
Weekly teaching time (minutes)	157.5±45.0	96.6±47.5	74.1±38.5	93.3±24.0

As can be seen in Table 24.1, the mean scores of the 'low-IQ' symbol and sign users were lower than the mean scores of the 'higher-IQ' children on almost every measure; but the differences reached significance in only a few cases. The effect of IQ, adjusted for the Bliss/Makaton Group effect, was significant for the following measures: the number of signs/symbols the children had been taught, the percentage of signs/symbols acquired at the expressive level, the total number of utterances produced during the half-hour recording session, and the number of phrases produced by children at Stage III of the LARSP profile. In each case the 'low-IQ' children achieved lower scores than the 'higher-IQ' children, after adjusting for the Bliss/Makaton

Table 24.2: Acquisition and Use of Signs/Symbols: F-ratios for Bliss/Makaton Group and IQ Effects

	Bliss/Makaton Group Effect (adj.for IQ)	IQ Effect (adj. for Bliss/Makaton Grp)	Interaction Effect
Symbols/signs taught	0.19	5.09*	0.85
% symbols/signs understood	5.48*	0.04	0.11
% symbols/signs produced	20.59**	5.35*	0.19
Total utterances produced	0.00	6.17*	1.72
% spontaneous utterances	1.07	0.17	0.01
% response utterances	1.07	0.17	0.01
1-term utterances	0.84	3.79	3.08
Multi-term utterances	2.09	3,25	0.05
% Stage I entries out of entries at Stages I-V	4.43*	2.78	0.05
Stage II clauses	1.26	2.63	0.07
Stage II phrases	1.68	1.45	0.16
Stage III clauses	3.52	1.30	1.47
Stage III phrases	0.14	4.42*	0.20
Stage IV clauses	0.31	0.13	-
Stage IV phrases	1.95	0.03	-
Requests	0.04	0.12	-
Responses	1.08	1.28	-
Descriptions	9.49*	0.80	-
Statements	1.35	0.85	1.47
Organization devices	0.53	0.20	0.22
Months on Bliss/Makaton pre-study	0.04	1.59	5.44*
Weekly teaching time (min.s)	4.84*	0.74	7.59*

Group effect. On the number of single-term utterances produced, the Bliss/Makaton x IQ interaction effect was just short of significance. Examination of Table 24.1 shows that the 'low-IQ' Signers produced fewer single-term sign utterances than the 'higher-IQ' Signers; but in the Bliss group the 2 IQ groups produced similar mean numbers of single-term utterances. In the case of the number of multi-term utterances produced, the effect of IQ, adjusted for Bliss/Makaton group, just missed significance, with the 'low -IQ' children in both groups achieving lower scores than the higher-IQ children.

These data indicate that although the severely/profoundly mentally handicapped children achieved poorer mean scores than the moderately mentally handicapped-average IQ children on almost all the variables (including the number of signs/symbols acquired at the expressive level, the total number of utterances produced, and the percentages of these which were spontaneous and multi-term utterances), relatively few of the differences were statistically significant. Even more relevant is the finding that all the profoundly/severely mentally handicapped subjects acquired at least a few symbols/signs, and that all 4 'low-IQ' Bliss Users and 6 of the 11 'low-IQ' Makaton Signers were able to use these symbols and signs in semi-structured conversational settings. Thus the 'low-IQ' Bliss Users acquired a mean of 41.75 symbols at the receptive level and 35.25 symbols at the expressive level; the 'low-IQ' Signers acquired a mean of 18.27 signs at the receptive level and 14.36 signs at the expressive level. Furthermore, the 'low-IQ' Bliss Users produced a mean of 9.75 utterances and the 'low-IQ' Makaton Signers a mean of 3.33 utterances, during the recording sessions. These findings are all the more impressive when one bears in mind the relatively short period of time the children had been in sign and symbol programmes prior to the baseline assessment. The data therefore argue strongly against the current practice of many teachers and speech therapists in U.K. schools of excluding low-cognitive ability children from Blissymbol programmes purely on the grounds of their low IQs. The belief that severely to profoundly handicapped nonverbal children are 'unable to cope' with Bliss is, on this evidence, simply not justified. Although this conclusion is based on a sample of only 4 'low-IQ' Bliss Users, it receives confirmation from at least 3 other studies, all conducted outside the U.K., which have taught Bliss to severely/profoundly mentally handicapped children (Elder and Bergman, 1978; Galloway, 1978; Harris-Vanderheiden, Brown, MacKenzie, Reinen and Scheibel, 1975). While these studies provided few details of the children's ability levels, they too found that at least some low cognitive ability children could learn to acquire and use at least some Blissymbols.

Examining the mean scores of the 2 'low-IQ' groups (see Table 24.1), it further appears that the 'low-IQ' Bliss Users achieved a somewhat better performance than the 'low-IQ' Signers in terms of the percentage of symbols understood and produced, the total number of utterances produced, and the percentage of multi-term out of total utterances. Furthermore, all 4 'low-IQ' Bliss Users, but only 6 of the 11 'low-IQ' Signers, produced symbol/sign messages during the recording sessions. These findings may be taken to indicate that Blissymbols are easier for the severely/profoundly mentally handicapped to acquire and use than are BSL (Makaton) signs. However, it is relevant to bear in mind the analysis of variance results, which revealed significant IQ x Bliss/Makaton Group interaction effects for 2 important teaching variables - duration of the Bliss/Makaton programmes, and weekly teaching time. The 'low-IQ' Makaton Signers had been in signing programmes for a considerably shorter period of time prior to baseline assessment (a mean of 7.8 months) when compared with the 'low-IQ' Bliss Users (a mean of 13.3 months), and also when compared with the 'higher-IQ' Signers (mean = 13.6 months) (see Table 24.1). Moreover, while the 'low-IQ' Bliss Users were receiving significantly more weekly teaching time than the 'higher-IQ' Bliss Users (a mean of 2 hours 38 minutes compared with 1 hour 37 minutes), the 'low-IQ' Makaton Signers were receiving less teaching time than the 'higher-IQ' Signers (a mean of 1 hour 14 minutes compared with a mean of 1 hour 33 minutes). The weekly teaching input received by the 'low-IQ' Signers was thus on average half that received by the 'low-IQ' Bliss Users. The reason for this different pattern of teaching input (depending on ability and augmentative system) is not entirely clear. Given that the Bliss Users tended to be in PH Schools, and the BSL (Makaton) Signers in ESN(S) Schools, it would seem that in the former type of school speech therapists and teachers were giving more input to the less able children, that is the children who perhaps were felt to need it more; whereas in ESN(S) Schools staff may prefer to work with the higher ability child who has 'more potential'. Whatever the reason, it is clear that profoundly/severely mentally handicapped children do benefit from augmentative communication training, and that greater teaching input for this group is likely to make for even more progress. This question will be returned to in a later chapter, where the longer term progress of the children in symbol/sign acquisition and use will be described.

Chapter 30. Additional Aspects of Bliss and BSL (Makaton) Use - Symbol Indication and Accuracy of Signing

An important aspect of the use of Blissymbols concerns the methods employed by the children in accessing or indicating the symbols they have available, and the possible differential effects of these methods on symbol acquisition and use. The most straightforward means of symbol indication is by a hand or finger pointing response. However, within the population of nonverbal individuals, there are many who are so severely physically involved that they are unable to use controlled movements of the hands to indicate the symbols on a communication display accurately or reliably. In such cases neuro-assisted means may be introduced (eg. a light pointer). Alternatively eye pointing may be used, often in combination with a scanning technique. With this approach, the child typically indicates the general area on the Bliss chart where the desired symbol is to be found using eye pointing, and the message receiver then acts as a scanning aid, pointing to the symbols in that area one at a time until the child signals that the desired symbol has been reached.

In the present Bliss sample 8 children (40%) used a fine hand movement (for example a single finger) to indicate the symbols; 3 children (15%) used a gross hand movement (for example a fist); 4 children (20%) used eye pointing, and 5 children (25%) used a combination of eye pointing and gross hand movements. No child relied exclusively on special equipment (for example head pointers or electronic pointers) for indicating, although such devices were often used to facilitate indication during formal sessions. In addition, 6 of the children (4 eye pointers and 2 hand pointers) also had access to Bliss programmes on computer during certain formal teaching sessions. Outside of such formal sessions, however, all the children relied on either hand or eye pointing to indicate symbols in communicative interactions. As expected, the eye and hand pointing groups differed significantly in terms of the severity of their physical handicaps ($\chi^2 = 8.81$, $d.f.=2$, $P = .012$), with all the moderately to severely handicapped children using hand pointing, and 69% of the children rated as totally or almost totally incapacitated using eye pointing (see Table 25.1).

Table 25.1: Distribution of Method of Symbol Indication by Severity of Physical Handicap

	Hand Pointers (n = 11)		Eye Pointers (n = 9)	
Severity of Physical Handicap	n	%	n	%
None/slight	0	0	0	0
Moderate	1	9.1	0	0
Severe	6	54.5	0	0
Total/almost total	4	36.4	9	100

Eye pointing is obviously very powerful since it can be used by almost any child, no matter how severe his/her physical disability. The chief disadvantage of this approach is that it is very slow when compared with direct selection (i.e. hand pointing), and it also affords less than direct contact with the communication board. The scanning approach, which is typically used together with eye pointing, is rather passive, and in some ways is cognitively more complex than direct selection, since the child must compare each item with the one he/she has in mind and then accept or reject each. In view of these differences, a number of writers have argued that symbol output will be much more spontaneous and frequent when a direct selection method is used for indicating symbols, than when eye pointing is used (eg. Bailey and Jenkinson, 1982). However, there are no data available to shed light on this question. The present writer therefore decided to compare the children using hand and eye pointing on the measures of symbol acquisition and use described in Chapters 27 and 28, as well as on other relevant measures. The results of these comparisons are presented in Table 25.2.

As can be seen, there were few significant differences between the 2 groups of Bliss Users. The hand pointers achieved a significantly higher mean score than the eye pointers on the motor imitation task, which is to be expected in view of their greater degree of hand control. On the other hand, the eye pointers achieved higher scores on the Raven's CPM (Set A), on the Form Perception subtest of the Frostig DTVP, and on the SPT. As explained in previous chapters, the better performance of these more severely physically handicapped children on these measures is most likely due to the presence, in the Bliss group, of a number of severely physically handicapped athetoid and quadriplegic children who were very able intellectually. Because of their severe physical handicaps, these children all used eye pointing. Despite these differences, there were no significant differences between the eye and hand pointers on any of the measures of symbol acquisition or use. On one measure, the number of requests expressed, the difference just missed significance, with the hand pointers using this communicative function more often than the eye pointers. This would accord with the view that direct selection fosters more spontaneous usage of Bliss than does eye pointing. However when this measure was re-examined, after controlling for the physical handicap and cognitive differences between the 2 groups, the difference was no longer apparent. It would thus appear that where workers in the field do find differences in the use of Bliss between eye and hand pointers, these are most likely to be due to characteristics of the children (for example physical and cognitive skills), rather than to the nature of the method of symbol indication that is used.

Table 25.2: Comparisons Between the Eye and Hand Pointers on Cognitive and Language Measures, and the Acquisition and Use of Blissymbols

	Hand Pointers (n = 11)		Eye Pointers (n = 9)		
	Mean	S.D.	Mean	S.D.	t
Columbia Interlevel Scale	245.09	29.51	263.44	40.49	1.14
Raven's CPM	3.46	1.70	6.00	2.12	2.99*
Frostig-Form Perception	3.09	2.43	6.56	3.05	2.83*
Frostig-Position in Space	2.91	2.39	1.89	1.54	1.11
Reynell Comprehension	43.00	9.58	50.89	7.99	1.97
Reynell Expression	10.09	7.12	5.33	4.56	1.73
Motor imitation	6.00	2.53	3.56	2.13	2.30*
Verbal imitation	3.18	4.69	0.33	1.00	1.96
Gestural expression	23.00	8.32	16.78	5.52	1.92
Gestural comprehension	12.46	4.55	14.56	2.01	1.38
Symbolic Play Test	19.46	5.34	23.33	1.00	2.36*
Months on Bliss pre study	9.64	6.17	12.33	4.61	1.08
Weekly teaching time (min.s)	99.09	57.13	120.56	45.80	0.91
Number of symbols taught	49.09	42.91	92.89	63.78	1.83
No. symbols understood	38.64	37.78	72.78	53.03	1.68
No. symbols produced	37.64	32.76	66.44	50.23	1.55
Total utterances	12.73	9.28	12.89	10.59	0.04
No. spontaneous utterances	6.46	5.84	4.56	4.25	0.81
No. response utterances	6.27	4.27	8.33	6.87	0.82
1-term utterances	7.27	3.98	9.33	9.45	0.61
Multi-term utterances	5.46	6.52	3.56	2.51	0.89
MSLU	1.49	0.54	1.37	0.27	0.64
% Stage I entries out of entries at Stages I-V	63.73	33.00	69.67	21.89	0.46
Requests	2.36	2.69	0.56	1.01	2.06
Responses	6.00	4.05	8.33	6.87	0.95
Descriptions	3.09	4.35	3.67	4.24	0.30
Statements	0.64	1.03	0.22	0.44	1.21
Organization devices	0.09	0.30	0.00	0.00	0.90

In the BSL (Makaton) group, the children's speech therapists were asked to rate the accuracy with which they produced signs. It was found that at baseline only 1 child produced signs exactly and precisely; 8 children (40% of the sample) produced sign approximations which were easily identifiable, while 11 children (55%) tended to produce vague signs which were difficult to identify. In the case of these latter children, teachers and speech therapists who work closely with them and usually determine the context within which signing is produced, are likely to understand many of their signing attempts; but people who are less familiar with these children would undoubtedly have great difficulty in understanding their sign productions. Such poor articulation of signs is likely to have a deleterious effect in limiting these children's potential audience, even among people who are familiar with BSL (Makaton). Little attention has been paid to sign articulation in past studies, but the present data point to a significant need for research geared to pinpointing and remediating sign articulation errors.

Correlational procedures were used to examine the extent to which accuracy of signing was related to the measures of sign acquisition and use, and other variables. The resulting tau coefficients are presented in Table 25.3. The accuracy of signing correlated significantly but modestly with performance on the Columbia MMS, the Symbolic Play Test and comprehension of gestures, while the correlation with gestural expression just missed significance. The modest correlations

Table 25.3: The Relationship Between Accuracy of Signing and Measures of Cognitive Abilities, Language, and Sign Acquisition and Use (n = 20)

	Tau		Tau
Severity of physical handicap	-0.11	% signs understood	0.34*
Columbia Interlevel Scale	0.37*	% signs produced	0.57*
Raven's CPM	0.15	Total utterances	0.19
Frostig - Form Perception	0.19	No. spontaneous utt.s	0.16
Frostig - Position in Space	0.16	No. response utt.s	0.23
Reynell Comprehension	0.10	1-term utterances	0.17
Reynell Expression	0.09	Multi-term utterances	0.08
Motor imitation	0.23	MSLU	0.08
Verbal imitation	0.07	% Stage I entries out of entries at Stages I-V	-0.13
Gestural expression	0.30	Requests	0.03
Gestural comprehension	0.45*	Responses	0.19
Symbolic Play Test	0.33*	Descriptions	0.14
Mnths on Makaton pre study	0.31	Statements	-0.05
Weekly teaching time (min.s)	-0.01	Organization devices	-
Number of signs taught	0.18		

obtained are likely to be due to the limited range of the accuracy of signing measure. On the other hand, the correlations with severity of physical handicap and motor imitation were nonsignificant. Again, this may be due to the limited range of scores in the variables concerned; alternatively, these latter findings may suggest that physical skills per se are less relevant for sign articulation than are the representational and perceptuo-spatial skills involved in the use of gesture and symbolic play skills. The limited range of scores involved may further account for the absence of significant correlations between accuracy of signing and the measures of sign use. However, significant correlations were found with the percentage of signs acquired at the expressive and receptive levels. These results suggest that accuracy of signing is an important factor in sign acquisition, and they underline the importance of fostering better sign articulation in children whose signing attempts may be vague and difficult to understand.

Chapter 31. Analyses of the Children's Spoken Language Samples

Many sign and symbol training studies have claimed that speech often develops spontaneously in nonverbal children exposed to augmentative communication programmes (see Chapter 14); but few studies have gathered systematic data on this question. In the present investigation, in addition to obtaining sign and symbol language samples, the children were seen for a second 30-minute recording session at baseline and at the follow-up assessments, in order to gather samples of their spoken language productions. The procedure used to record the spoken language utterances was described in Chapter 19.3.3. The reader is reminded that many of the children typically communicated in a number of modes, including signs/symbols, gestures, facial expressions and vocalizations. All these were noted down during the speech recordings, but analysis was confined to the spoken utterances which were produced. The results of the syntactic, semantic and pragmatic analyses of the speech samples gathered at baseline are presented in this Chapter.

31.1 General Indices of Syntactic Development in the Spoken Language Samples

Whereas all 20 Bliss Users and 15 of the 20 BSL (Makaton) Users produced at least 1 symbol/sign utterance during the augmentative communication recording sessions, only 6 of the Bliss Users and 14 of the Signers produced any spoken utterances during the speech recording sessions. The analyses which follow are thus based on a much reduced sample size, which includes significantly more BSL (Makaton) Users than Bliss Users ($\chi^2 = 4.90$, d.f. = 1, $P = .027$). As can be seen in Table 26, the 6 Bliss Users produced a mean of only 4 spoken utterances (range 1 - 7), and the Makaton Signing group a mean of 15.43 spoken utterances (range 1 - 65). In both groups 90% of all utterances were only 1-word long, and the MLU-M obtained was 1.13 for the Bliss group (range 1.00 - 1.50) and 1.18 for the Makaton group (range 1.00 - 2.66). Thus one-half of the total sample of children produced no spoken words at all during the 30-minute recording sessions, while the remaining children produced relatively few utterances, the overwhelming majority of which were only 1 word in length. The ranges reported above suggest considerable variability, particularly among the Makaton Signers, in the number and length of spoken utterances which were produced. However, the paucity of these data in general contrasts sharply with findings

Table 26: General Indices of Syntactic Development in the Speech Samples

	Bliss Group (n = 6)		BSL (Makaton) Group (n = 14)		
	Mean	S.D.	Mean	S.D.	$\underline{t}$
Total No. of utterances	4.00	2.37	15.43	20.12	2.09
% spontaneous utterances	5.17	8.06	52.50	33.52	4.96**
% response utterances	94.83	8.06	47.50	33.52	4.96**
Mean morpheme length of utt.	1.13	0.21	1.18	0.45	0.24
% single-word utterances	89.33	20.07	90.29	21.71	0.09
% 2-word utterances	10.67	20.07	6.14	11.79	0.64
% 3-word utterances	0.00	0.00	1.79	5.32	0.81
% 4+ - word utterance	0.00	0.00	1.79	6.68	0.64
% multi-word utterances	10.67	20.07	9.71	21.71	0.09

for younger normal children, and even language disordered children,who typically produce between 100 and 200 utterances in 30 minutes of recording (eg. Crystal, Fletcher and Garman, 1976; Udwin, 1981). This discrepancy is only to be expected since one of the criteria for including children in the study was that they were essentially non-verbal, that is they had no more than approximately 30 intelligible spoken words at baseline.

Comparisons between the speaking Bliss and Makaton Users showed that the Signers, although still severely impaired in spoken language, produced more total utterances than the Bliss Users (this difference just missed significance), and furthermore that the Signers produced significantly more spontaneous utterances, and significantly fewer response utterances, when compared with the Bliss Users (see Table 26). Approximately half of the BSL (Makaton) group's utterances were initiated spontaneously, whereas only 5% of the Bliss group's utterances were spontaneous productions. Again, these findings are hardly surprising. They accord with the results described in Chapter 25.2, where it was found that the Signers attained significantly higher mean scores on the Reynell Expression Scale and Verbal Imitation Test, had more sounds and spoken words, and were rated by speech therapists as having significantly more intelligible speech, than the Bliss Users. As discussed in Chapter 25.2, these findings can be explained in terms of the fact that the signing children had significantly fewer physical handicaps, and in particular were described by speech therapists as having significantly less impairment of the speech musculature and fewer feeding difficulties, when compared with the Bliss Users. As was shown in Table 15.6, 85% of the Bliss group were rated as having severe to very severe impairment of the speech musculature, compared with only 40% of the BSL (Makaton) group who were so rated. In this regard it is important to reiterate that the neuromuscular status of the oral musculature is one of the most important factors in the development of vocal language. On the other hand, it is also evident that the poverty of the spoken language productions found in recording, in terms of both the number of utterances produced and their length, cannot be accounted for solely in terms of speech musculature impairment, since a fair number of children (particularly in the Makaton group) had minimal such impairment. The possible role of other factors in accounting for the restricted spoken language samples (including cognitive factors and the restrictions imposed by the children's physical handicaps more generally) were explored in detail in Chapters 25.2 and 27.1, and therefore will not be re-examined here.

Interestingly, the 2 groups did not differ significantly in terms of the mean length of their spoken utterances, nor in terms of the percentage of utterances which involved word combinations. This is a reflection of the restricted length of the utterances produced by both groups, most of which were only 1 word long.

When the differences between the Bliss and BSL (Makaton) groups on the total number of utterances and percentage of spontaneous utterances produced, were re-examined with analysis of covariance procedures (controlling for severity of physical handicap as well as IQ), it was found that these differences were fully explained by the effects of the covariates ($F = 0.298$, $P = .593$; $F = 1.310$, $P = .269$). It may thus be concluded that once the 2 groups were equated on these 2 variables, neither augmentative system seemed to have fostered greater use of spoken language utterances than the other, at least at this early stage of training.

31.2 Syntactic Analysis of the Spoken Utterances Using the LARSP Procedure

The Bliss and BSL (Makaton) Groups' mean scores on the full set of LARSP structures are presented in Appendix 24, in terms of both the frequency of occurrence of each structure, and the percentage of spoken utterances (out of the total number of utterances) entered in each category of structure. Table 27 provides a number of summary measures of spoken language performance on the LARSP profile. It should be noted that utterances which were unintelligible (due to the

Table 27: Performance of the Speaking Bliss and BSL (Makaton) Users on the LARSP Summary Measures

LARSP Summary Measures	Bliss Users (n = 6) Mean	Bliss Users (n = 6) S.D.	Makaton Users (n = 14) Mean	Makaton Users (n = 14) S.D.	t
% verbs out of 1-word utterances	11.40	17.60	5.57	12.50	0.81
% nouns out of 1-word utterances	18.00	18.43	46.43	31.61	1.88
% 'other' words out of 1-word utt.s	6.60	14.76	8.29	14.13	0.23
% Stage I entries out of entries at Stages I-V	71.75	37.85	84.92	26.28	0.78
No. clauses at Stage II	0.17	0.41	1.07	3.20	1.04
No. phrases at Stage II	0.50	0.84	2.50	7.43	0.99
No. clauses at Stage III	0.00	0.00	1.71	6.13	0.67
No. phrases at Stage III	0.17	0.41	3.00	10.66	0.99
No. clauses at Stage IV	0.00	0.00	0.14	0.54	0.64
No. phrases at Stage IV	0.00	0.00	0.50	1.16	1.04
Total No. complex utterances	0.00	0.00	0.00	0.00	0.00
Total No. inflections	0.17	0.41	0.79	2.39	0.94
% Stage II clauses out of phrases + clauses at Stage II	16.50	23.34	24.00	16.06	0.48
% Stage III clauses out of phrases + clauses at Stage III	0.00	0.00	29.00	25.94	0.97
% Stage II clauses out of clauses at Stages I + II	12.50	25.00	5.33	13.79	0.74
% Stage III clauses out of clauses at Stages II + III	0.00	0.00	33.00	33.00	0.87
% clauses at Stage II with phrase expansions	0.00	0.00	2.67	4.62	0.50
% clauses at Stage III with phrase expansions	0.00	0.00	30.50	43.13	1.00

child's articulation difficulties) were excluded from the anaylis.

Given the children's severe impairments in spoken language, and the relatively small numbers of spoken utterances produced, most of which were 1-word long, it is not surprising to find that the overwhelming majority of utterances were scored as Stage I entries or Minor utterances. There were very few Stage II and III entries, and no complex sentences. Thus 63% of the Bliss Users' spoken messages were Minor utterances (eg. 'yes', 'no', 'bye'); a further 14% comprised single nouns, 9% were single verbs, and 2.8% were 'other' single words (eg. adjectives, pronouns). In the case of the Makaton Signers' utterances,only 35% were Minor utterances, but 42% were single nouns; 3.6% were single verbs and 7.6% were 'other' single words. Turning to consider the Stage II entries, 2.8% of the Bliss group's utterances were subject + verb clauses, 5.2% were determiner + noun phrases, and 2.8% were 'other' 2-word phrases. The pattern for the Sign Users was rather different, with fewer entries which were spread over a wider range of 2-term clause and phrase categories. With only 2 exceptions, the Bliss Users produced none of the advanced LARSP structures at Stages III, IV or V, and no inflections. The Makaton Users, too, only rarely produced such structures as subject + verb + object, verb + object + adverbial, and the conjunction 'and'. The 2 exceptions to this picture concerned the pronoun category and the present progressive inflection, which were produced in 2.8% and 2.3% of the Bliss group's spoken utterances, and in 5.4% and 1% of the Signer's spoken utterances respectively. Clausal expansions were not produced at all by the Bliss group, and only rarely by the Makaton group.

The data thus suggest severe deficits on the LARSP profiles, with the frequent use of a limited number of Stage I structures, and many noticeable gaps, particularly in the case of the Bliss group, for such structures as questions and commands, negation, the use of adjectives and adverbs, and inflections.

Interestingly, despite the Makaton group's significantly better performance on the Reynell Expression Scale and related measures, and despite this group's fewer speech musculature impairments, there were no significant differences between the 2 groups on any of the LARSP measures. These results can be explained in terms of the relatively few utterances produced by both groups, and the small number of Bliss Users who produced speech at all. However, in the case of 2 structurs the differences between the groups were not far off significance. More single nouns were produced by the Makaton Users; while more Minor utterances were produced by the Bliss Users. In this regard, it is relevant to point out that Minor utterances are typically short words (eg. 'bye', 'yeh', 'hi') which are easier to articulate than are many other single words.

The children included in the present study were selected because they had extremely limited or no spoken language. The LARSP profiles confirm this fact, but because of the small numbers of entries, they can provide little additional information on the children's speech skills.

31.3 Word Ordering in the Spoken Language Samples

Only 10.7% of the Bliss Users' spoken utterances and 9.7% of the Makaton Signers' spoken utterances were multi-word combinations, and very few of these involved combinations of subject, verb and object, or the use of a noun with a determiner, adjective and/or preposition. The percentages of spoken utterances using combinations of these elements in correct English word order are presented in Table 28.

Table 28: The Percentages of Spoken Utterances Demonstrating Conventional English Word Ordering

	Bliss Users		BSL (Makaton) Users	
	No. of subjects	% utterances	No. of subjects	% utterances
Subject + verb	1	100	1	100
Verb + object	0	0	2	100
Subject + object	0	0	0	0
Subject+verb+object	0	0	1	100
Determiner + noun	2	100	2	100
Adjective + noun	0	0	2	100
Preposition + noun	0	0	1	100
Determiner+adj.+noun	0	0	0	0
Preposition+determiner+ noun	0	0	0	0

As can be seen, no children produced subject + object, determiner + adjective + noun, or preposition + determiner + noun strings, while only 1 to 4 children produced utterances using other combinations of the above elements. Nevertheless, it is interesting to find that in the few cases where these severely language impaired, physically handicapped children did produce spoken word combinations, these always corresponded to the dominant adult order. These results are in accord with the findings on order in the children's symbol and sign combinations (see Chapter 27.3), and further agree with Brown's (1973) claim that the early utterances of normal speakers are almost always in correct English word order. The reader is however reminded of Dale's (1977) finding for Down's Syndrome children; their early spoken utterances followed normal combinational patterns, but they later showed many incorrectly ordered utterances when trying to use more complex structures.

31.4 Semantic Relations Expressed in the Spoken Language Samples

Table 29 presents the mean frequencies with which 2-, 3- and 4-term semantic relations were expressed in the children's word combinations, and the percentage of utterances which fitted each semantic category. As already noted, very few of the children produced multi-word utterances; in fact only 3 BSL (Makaton) Users and 1 Bliss User produced utterances which could be categorized semantically. In view of this, comparisons between the Bliss and Makaton Users on these categories could not be undertaken, and the frequency data presented

Table 29: Semantic Relations Expressed in the Spoken Utterances

	Bliss Users (n = 1)		BSL (Makaton) Users (n = 3)	
	No. of utts.	% of tot.utt.s	Mean No. of utt.s	% of tot.utt.s
Two-term Relations				
Agent - action	1.00	17.00	1.33	2.00
Action - object	0.00	0.00	2.00	4.00
Agent - object	0.00	0.00	0.00	0.00
Modifier - head	0.00	0.00	2.33	4.00
Negation - X	0.00	0.00	2.67	5.00
Action - location	0.00	0.00	0.67	2.33
Agent/object - location	0.00	0.00	0.33	0.67
Introducer - X	0.00	0.00	1.33	2.33
Other relations	0.00	0.00	1.00	2.33
Unclassifiable	0.00	0.00	0.33	0.67
% 2-term relations classified	100.00	-	86.67	-
Three-term Relations				
Agent-action-object	0.00	0.00	2.67	4.00
Experiencer-state-source	0.00	0.00	0.00	0.00
Introducer-modifier-head	0.00	0.00	2.00	4.00
Agent-action-location	0.00	0.00	0.33	0.67
Action-modifier-head	0.00	0.00	0.00	0.00
Other relations	0.00	0.00	4.33	6.67
Unclassifiable	0.00	0.00	0.00	0.00
Four-term Relations				
Agent-action-object-location	0.00	0.00	0.33	0.67
Other relations	0.00	0.00	0.67	1.00
Unclassifiable	0.00	0.00	0.00	0.00

in Table 29 are not generalizable. The single Bliss User produced only 1 2-word utterance, which expressed an agent-action relation. However, the results do show that the early word combinations of the 3 BSL (Makaton) Users corresponded very closely with the early utterances of younger normal speakers, in terms of the types of semantic meanings expressed. Over 85% of these children's 2-word utterances could be accounted for in terms of the set of 8 semantic relations which were found by Brown (1973) to be prevalent in the early spoken utterances of normal speakers. The 2-term relations of action-object, modifier-head and negation-X, and the 3-term relations of agent-action-object and agent-action-location, occurred most frequently in these children's utterances; agent-action, action-location, agent/object-location and introducer-X relations occurred less frequently, while agent-object relations were not expressed at all.

These data are in broad agreement with the findings of Florance (in MacDonald, 1978), Freedman and Carpenter (1976) and Coggins (1979) on the relative frequency of occurrence of 2-term semantic relations in the speech of younger normal children and also mentally handicapped children, and they further accord with the findings of Bloom (1970), Brown (1973), Bowerman (1976) and others, that the 3 semantic concepts of agent, action and object dominate children's early language productions.

These findings, and the results on the semantic relations expressed in the present sample's sign and symbol utterances, thus indicate that despite the children's physical handicaps, and despite their severe expressive and receptive language deficits, when they did communicate in multi-term utterances, they expressed the same semantic meanings as do younger normal speakers. As already discussed in Chapter 27.4, this finding would seem to underline the universality of the semantic relations expressed in the initial stages of acquisition of communicative skills. Brown (1973) and others have explained such similarities in the acquisition of meaning in terms of the universality of the underlying cognitive structures which provide children with the necessary knowledge to organize their experiences with people, objects and events. However, the fact that the present subjects were also moderately to severely physically handicapped, would appear to place in some doubt Brown's further claim that these early meanings are the expression of the accomplishments attained by children in the stage of sensorimotor development. At least in the case of the cerebral palsied children considered here, it would appear that they were able to acquire the cognitive structures necessary for the expression of the semantic relations concerned in ways other than through normal motor activity and physical interaction with the environment. Rostron and Sewell (1983) have argued in this regard that it is not motor movement per se that contributes to cognitive development, but the opportunity motor activity normally provides to make sense of, and construct internal models of the world. Severely physically handicapped children may acquire cognitive skills and meanings by achieving some consistent interaction with the environment in other ways.

A final point to reiterate is that very few of the children produced 2-word or longer utterances, and that while the types of semantic relations that these few children expressed were qualitatively similar to the early relations produced by normal speakers, the data are of course very different quantitatively.

31.5 Communicative Functions Expressed in the Spoken Language Samples

Mean frequencies and percentages of occurrence of the communicative functions expressed in the children's spoken utterances were calculated for each of the Bliss and BSL (Makaton) groups, using Dore's (1977, 1979) model of conversational acts. These data are presented in Appendix 25, while a summary of the results is shown in Table 30.

Table 30: Summary of Communicative Functions Expressed in the Spoken Language Samples - Mean Number of Utterances and Percentage of Total Utterances in Each Category

	Bliss Users (n = 6)	Makaton Users (n = 14)	
Communicative Function	%	%	*t*
Requests	0.00	3.57	1.73
Responses	94.83	47.93	4.88**
Descriptions	2.33	40.00	4.16**
Statements	0.00	2.71	0.95
Organization devices	0.00	3.71	0.96
Performatives	0.00	0.64	0.64
Other functions	0.00	0.00	0.00
Uninterpretable	2.83	1.50	0.56

Examination of the data reveals considerable restriction in the number of different communicative functions expressed, particularly among the Bliss Users. These 6 children only expressed 3 types of communicative functions in their utterances, with 94.8% of their messages being yes/no answers or Wh-answers, and a further 2.3% of their messages expressing a labelling function. The picture among the Makaton Signers was only slightly better; although 16 different communicative functions were expressed at least once, 76% of all their spoken utterances could be accounted for in terms of just 4 communicative functions, namely yes/no answers, Wh-answers, repetitions and labelling. Moreover, while 52% of their spoken utterances were spontaneous initiations, over half of these expressed a simple labelling function.

The severe restrictions in the range and frequency of communicative functions expressed by both groups of children are striking when compared with the results presented by Dore (1977) for 3-year-old normal speakers (see Table 23). Dore's subjects expressed 32 different communicative functions in their utterances, and produced relatively fewer responses, and many more requests, statements and performatives than the present speakers. The present findings of restrictions in communicative use of speech parallel the earlier findings of restricted functional use of Blissymbols/Makaton Signs. As already discussed, these results are likely to be explained in terms of the passivity and lack of initiation that characterize many severely handicapped individuals, as well as in terms of the children's cognitive and physical handicaps themselves (including impairment of the speech musculature). In addition, it must be pointed out that the speech samples were not gathered in naturalistic settings, and that the nature of the recording sessions may have influenced the types of communicative functions expressed, at least to some extent. This may for example help to explain the relatively high percentage of identifications expressed by the BSL (Makaton) group.

Comparisons between the 2 groups of children revealed that significantly more of the Bliss Users' spoken utterances were responses to questions posed by the adult investigator, while significantly more of the Makaton Signers' utterances were spontaneous descriptions (see Table 30). These differences, and the greater diversity in the types of communicative acts used by the Signers, can be explained in terms of their superior speech skills. It will be recalled that the Signers produced more spoken utterances overall, and attained significantly higher mean scores on the Reynell Expression Scale and on a variety of other measures of spoken language (see Chapters 25.2 and 31.1). These differences were explained in terms of the fact that the BSL (Makaton) group had significantly fewer physical handicaps and less impairment of the speech musculature, when compared with the Bliss Users.

31.6 Summary of the Findings on the Syntactic, Semantic and Pragmatic Analyses of the Children's Spoken Utterances

Half of the sample produced no spoken words at all during the baseline recording sessions. In the case of the 20 children who did produce spoken utterances, the overall picture yielded by the analyses was similar to that found for the sign and symbol language samples. As was the case for augmentative system use, very few spoken utterances were produced in the recording sessions, and most of these were only 1 word long. The children showed severe deficits in the range and frequency of the spoken language structures and functions produced, with many early syntactic structures and communicative functions not being used at all. Interestingly, however, the few children who did produce word combinations, used conventional English word ordering, and expressed similar types of semantic relations to those expressed by younger normal children. Again, these conclusions parallel the findings for the sign and symbol utterances produced by the children.

There were few significant differences between the Bliss and BSL (Makaton) groups on these measures, which may be explained by the fact that both groups produced very few spoken utterances and almost no multi-word utterances. However, where significant differences were found, they favoured the BSL (Makaton) group. This group produced more spoken utterances and a greater percentage of spontaneous utterances than the Bliss group. It will be recalled that the few significant differences between the 2 groups in the sign/symbol language samples related to the Bliss Users achieving a better average performance when compared with the Makaton group, and that this was explained in terms of the former group's higher cognitive and language comprehension abilities. The present findings, in contrast, can be accounted for in terms of the fact that the Makaton Signers had on average significantly fewer physical handicaps and, more particularly, significantly less impairment of the oral musculature when compared with the Bliss Users, and they were thus better able to articulate speech sounds.

In view of the small numbers of spoken utterances produced by the sample as a whole, there is little point in examining intercorrelations among the syntactic, semantic and pragmatic measures described above. However, it was considered worthwhile to compare the children's expressive sign/symbol samples with their spoken language samples, in terms of their syntactic and pragmatic aspects. The results of these comparisons are described in the following chapter.

Chapter 32. Comparisons Between the Children's Sign/Symbol and Spoken Language Samples

Table 31.1 shows the numbers of Bliss Users and BSL (Makaton) Signers who produced both sign/symbol and spoken utterances during recording sessions, and the numbers of children who produced sign/symbol utterances but no speech, speech but no signs or symbols, and neither signs/symbols nor speech. Only 12 Makaton Signers and 6 Bliss Users produced at least 1 sign/symbol utterance and at least 1 spoken utterance during the recording sessions. Comparisons between the children's augmentative communication and spoken language samples were thus restricted to these 2 subgroups. Comparison was further restricted to the syntactic and pragmatic analyses which were undertaken. The semantic measures were not included here because of the extremely small numbers of multi-term utterances which were produced in both the spoken and augmentative communication modes.

Table 31.1: The Numbers of Children Producing at Least One Sign/Symbol Utterance and One Spoken Utterance During Recording Sessions

The Bliss Group

At least 1 spoken word produced	At least 1 symbol utterance produced: Yes	No	
Yes	6	0	6
No	14	0	14
	20	0	20

The BSL (Makaton) Group

At least 1 spoken utterance produced	At least 1 sign utterance produced: Yes	No	
Yes	12	2	14
No	3	3	6
	15	5	20

Table 31.2 presents the means and standard deviations of the syntactic and pragmatic summary measures for the symbol/sign and

Table 31.2: Syntactic and Pragmatic Analysis Summary Measures - Means and Standard Deviations for the Sign/Symbol and Spoken Language Samples

	Bliss Users (n = 6)		BSL (Makaton) Users (n = 12)	
	Bliss	Speech	Makaton	Speech
Total utterances	19.17±14.74	4.00± 2.37	10.25±10.20	12.50±15.06
No.spontaneous utt.s	8.50± 6.72	0.33± 0.52	5.42± 7.87	7.17± 9.35
% spontaneous utt.s	45.17± 8.86	5.17± 8.06	51.75±32.12	53.92±30.99
No.response utt.s	10.67± 8.96	3.67± 1.97	4.83± 4.43	5.33± 6.40
% response utt.s	54.83± 8.86	94.83± 8.06	48.25±32.12	46.08±30.99
% 1-term utt.s	59.83±29.86	89.33±20.07	94.33±17.26	95.08±10.58
% multi-term utt.s	40.17±29.86	10.67±20.07	5.67±17.26	4.92±10.58
MSLU-MLU	1.67± 0.60	1.13± 0.21	1.06± 0.17	1.07± 0.16
No. single verbs	1.17± 0.98	0.50± 0.84	1.75± 1.87	0.67± 1.61
No. single nouns	8.17± 7.91	0.67± 0.82	6.17± 6.32	4.92± 4.08
No. 'other' words	0.17± 0.41	0.17± 0.41	1.08± 2.02	1.25± 2.26
% entries at Stage I out of entries at Stages I - V	55.75±31.69	71.75±37.85	91.73±21.65	91.64±12.79
Stage II clauses	3.67± 3.39	0.17± 0.41	0.83± 2.13	0.25± 0.62
Stage II phrases	2.00± 3.52	0.50± 0.84	0.17± 0.58	0.58± 1.24
Stage III clauses	2.67± 2.66	0.00± 0.00	0.00± 0.00	0.08± 0.29
Stage III phrases	3.33± 4.18	0.17± 0.41	1.17± 2.13	0.17± 0.39
Requests	2.17± 2.23	0.00± 0.00	0.58± 0.99	0.67± 0.99
Responses	10.50± 8.89	3.67± 1.97	4.50± 4.28	5.50± 6.72
Descriptions	5.50± 7.06	0.17± 0.41	4.67± 7.29	4.58± 4.52
Statements	0.67± 0.82	0.00± 0.00	0.08± 0.29	0.25± 0.62
Organization devices	0.00± 0.00	0.00± 0.00	0.00± 0.00	0.83± 2.29
Performatives	0.00± 0.00	0.00± 0.00	0.00± 0.00	0.42± 1.44

spoken language samples in each of the Bliss and BSL (Makaton) groups. In each group symbol/sign-speech difference scores were computed for each measure by subtracting the scores on each of the spoken utterance measures from the scores on the corresponding sign/symbol utterance measure. The mean difference scores in the Bliss and BSL (Makaton) groups were then compared using t-tests. As can be seen in Table 31.3, the t-tests yielded significant results on the following measures: total utterances produced, number and percentage of spontaneous utterances, percentage of response utterances, and the pragmatic category of statements. These results indicate that the mean symbol - speech difference scores for the Bliss group were significantly greater than the mean sign-speech difference scores for the Makaton group.

Table 31.3: Syntactic and Pragmatic Analysis Summary Measures - Comparison Between the Symbol/Sign - Speech Difference Scores of the Bliss and BSL (Makaton) Groups

Symbol/sign-speech difference scores	Bliss Users (n = 6) Mean	S.D.	Makaton Users (n = 12) Mean	S.D.	*t*
Total utterances	15.17	14.70	-2.25	16.52	2.18*
No. spontaneous utt.s	8.17	6.59	-1.75	9.51	2.28*
% spontaneous utt.s	40.00	6.23	-2.17	30.43	4.61**
No. response utt.s	7.00	9.27	-0.50	7.94	1.79
% response utt.s	-40.00	6.23	2.17	30.43	4.61**
% 1-term utt.s	-29.50	36.35	-0.75	8.63	1.91
% multi-term utt.s	29.50	36.35	0.75	8.63	1.91
MSLU-MLU	0.53	0.64	-0.01	0.07	2.09
No. single verbs	0.67	0.52	1.08	1.56	0.84
No. single nouns	7.50	8.04	1.25	7.05	1.70
No. 'other' words	0.00	0.63	-0.17	2.95	0.19
% entries at Stage I out of entries at Stages I - V	6.67	53.20	9.08	34.71	0.12
Stage II clauses	3.50	3.51	0.58	1.68	1.93
Stage II phrases	1.50	3.45	-0.42	0.79	1.34
Stage III clauses	2.67	2.66	-0.08	0.29	2.53
Stage III phrases	3.17	4.31	1.00	2.00	1.17
Requests	2.17	2.23	-0.08	1.08	2.34
Responses	6.83	9.26	-1.00	7.86	1.88
Descriptions	5.33	6.80	0.08	6.23	1.64
Statements	0.67	0.82	-0.17	0.72	2.22*
Organization devices	0.00	0.00	-0.83	2.29	0.88
Performatives	0.00	0.00	-0.42	1.44	0.70

Results on a number of additional measures were not far off significance. These were the number of response utterances, mean utterance length, the number of clauses at LARSP Stage III, and the pragmatic function categories of requests and responses. Examination of

Table 31.2 reveals that the 6 Bliss Users produced more total utterances, more spontaneous and response utterances, a higher mean length of utterance, more single nouns, more clauses and phrases at LARSP Stages II, III and IV, and more requests, responses and descriptions, in their Bliss language samples than in their spoken language samples. They also produced a greater percentage of spontaneous utterances and of multi-term utterances, and a lower percentage of response and single-term utterances, when they used Blissymbols than when they used spoken language. In contrast, the 12 Makaton Signers produced similar numbers of total, spontaneous and response utterances, the same mean length of utterances, and similar numbers of LARSP clauses and phrases, when using BSL (Makaton) Signing and speech. The Signers also produced very similar numbers of utterances in each of the pragmatic function categories, and similar percentages of spontaneous and response utterances and of multi-term utterances, in the sign and speech modes. The reader is further reminded that all 20 Bliss Users produced expressive language output in symbols, but only 6 of these children produced any spoken utterances; whereas in the Makaton Group 15 children in all produced sign output and 14 children produced spoken utterances.

These findings clearly show the value of an augmentative communication system for the cerebral palsied children in the Bliss group. Fourteen of these children were unable to produce any spoken utterances during the speech recording sessions, but all were able to produce at least 1 utterance in communicative interactions when they had access to an augmentative communication system. Moreover, the 6 children who were able to produce some spoken utterances in the recording sessions, produced more advanced expressive language (in terms of the number of utterances, their length and complexity) in the Blissymbol mode than in speech. In contrast, similar numbers of children in the BSL (Makaton) group were able to produce at least 1 sign and spoken utterance in the semi-structured conversational settings; and in the case of the 12 children who produced both signs and words, neither medium showed any advantage over the other in terms of the quantity or quality of language output that was produced. These findings are undoubtedly a reflection of the cognitive, linguistic and physical handicap differences between the 2 groups. The higher-IQ but more severely physically handicapped Bliss Users possessed language skills whose expression was masked by motor speech difficulties (i.e. their impaired speech musculature). When these children were provided with an appropriate output channel (Blissymbols), they were able to express these linguistic skills in an intelligible way. On the other hand, the Makaton group as a whole had fewer motor speech difficulties, but also lower levels of cognitive and linguistic abilities, when compared with the Bliss group. These speaking children's spoken language abilities were on average adequate for their language level, and the provision of a second expressive channel (signing) did not facilitate greater language expression. This finding might lead one to question the value of teaching BSL (Makaton) to groups of lower-IQ cerebral palsied children such as these, who have some speech and minimal impairment of the oral musculature. Certainly, signing did not provide scope for greater and more complex expressive language output than that which the children already had available in their speech. On the other hand, the possibility exists that where children have some spoken language, simultaneous sign and speech training may foster comprehension and expression of both signs and speech (Carr and Dores, 1981). The value of signing for such children might thus lie in enhancing both these channels of communication. This question must be left open for the present.

The relationship between the children's symbol/sign and speech utterances on the syntactic and pragmatic summary measures was also examined in another way - using nonparametric correlational procedures. The aim here was to determine the extent to which the rank orders in which these measures placed the children were the same for the symbol/sign and speech modes. The resulting Kendall correlation coefficients are presented in Table 31.4. In the BSL (Makaton) group, significant (if modest) correlations between the sign and speech samples were found for the number and percentage of spontaneous utterances, the percentage of response utterances, the measure of utterance length, most of the LARSP summary measures, and the pragmatic function of descriptions. In other words, on these measures there was a tendency for the 'good' Signers to be good verbally, and for the poor Signers to be poor verbally. No significant correlations were found in the Bliss group, but the correlations for the percentage of spontaneous and response utterances and the number of verbs and descriptions produced were moderately high. The absence of a greater number of significant correlations, particularly in the Bliss group, may be due in part to the small numbers of subjects and utterances involved. Nevertheless, the results confirm the conclusion that for most measures these children's spoken language does not accurately reflect the language skills which they can express when provided with a more appropriate (i.e. nonverbal) channel of expression.

Table 31.4: The Relationship Between the Sign/Symbol and Spoken Language Samples on the Syntactic and Pragmatic Measures

	Bliss Users (n = 6) tau	BSL (Makaton) Users (n = 12) tau
Total utterances	0.07	0.22*
No. spontaneous utterances	0.18	0.40*
% spontaneous utterances	0.53	0.38
No. response utterances	0.07	-0.07*
% response utterances	0.53	0.38*
% 1-term utterances	0.09	0.76*
% multi-term utterances	0.09	0.76*
MSLU-MLU	0.09	0.76*
No. single verbs	0.67	0.50
No. single nouns	0.23	0.13
% Stage I entries out of entries Stages I - V	0.18	0.59**
Stage II clauses	-0.12	0.48*
Stage II phrases	0.10	0.61
Stage III clauses	-	-
Stage III phrases	-0.12	0.25
Requests	-	0.00
Responses	0.00	-0.01*
Descriptions	0.60	0.51
Statements	-	-0.13
Organization devices	-	-
Performatives	-	-

Chapter 33. Teachers' and Parents' Descriptions of the Children's Communicative Abilities

Structured questionnaires were completed by the children's parents, and by their speech therapists or teachers, in order to obtain information about their patterns of communication at home and at school. These questionnaires, which are presented in Appendices 11 and 12, included questions concerning the children's motivation to communicate, the frequency with which they used a variety of communicative modes to express needs and wants, the frequency with which they used Blissymbolics or BSL (Makaton) Signing to communicate, and the range of people with whom they communicated. The resulting picture of the children's communicative abilities at baseline is described in this chapter.

33.1 The Children's Communicative Abilities and Use of Bliss/Makaton at school

The child's desire to communicate is likely to be of prime importance for the successful use of augmentative systems of communication. Motivation to communicate was assessed by asking speech therapists to rate the extent to which the children attempted to obtain the attention of adults, showed interest in other people by watching them, 'asked' for objects or activities, attempted to indicate more complex desires, expressed affection and greeting, drew attention to things, answered questions posed by others, engaged in 2-way interactions with others, and attempted to communicate spontaneously about events. Each of these items was given a score of 0 (never), 1 (occasionally) or 2 (often), and the scores of all items were then summed to yield a total score of the child's 'desire to communicate'. Results on the individual items are given in Table 32.1. As can be seen, 60% to 85% of the Bliss and BSL (Makaton) Users were rated as frequently obtaining the attention of others, watching others and asking for objects or activities, and a further 15% to 30% of children performed such activities occasionally. Furthermore, between 75% and 100% of the children were said to draw attention to things and to express greeting and affection at least occasionally.

Table 32.1: Teacher Ratings of Motivation to Communicate

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Usually %	Occ. %	Never %	Usually %	Occ. %	Never %	χ^2
Gets adult's attention	70	30	0	85	15	0	0.57
Watches other people	85	15	0	75	25	5	1.27
Asks for objects/ activities	60	40	0	65	30	5	1.33
Draws attention to things	60	35	5	45	45	10	1.01
Expresses affection	35	40	25	70	20	10	4.95
Expresses greetings	55	45	0	55	30	15	3.60
Indicates complex desires	15	55	30	25	15	60	7.07*
Answers questions	30	60	10	10	50	40	5.88*
Engages in 2-way interactions	35	60	5	25	60	15	1.33
Communicates spontaneously	5	45	50	5	30	65	0.99

However, more demanding communicative activities such as indicating complex desires, answering questions and communicating spontaneously, were performed 'frequently' by only 5% to 35% of the children in each group; 30% of the Bliss Users and 60% of the Makaton Signers never attempted to indicate complex desires, 10% of the Bliss Users and 40% of the Makaton Signers were unable to answer questions posed by adults, and 50% of the Bliss Users and 65% of the Signers never attempted to communicate spontaneously with other people.

These restrictions in the children's communicative attempts, particularly as regards the indication of complex desires and spontaneous initiations, bear out the earlier findings of limited use of signs/symbols and speech in the 30-minute conversational settings. This picture is not unexpected in physically handicapped, minimally verbal children such as those constituting the present sample. Such children have often been described by other writers as 'passive' and 'unmotivated' in social interactions (eg. McDonald, 1980a). Their poor motivation to communicate arises from several sources. They are seldom given opportunities to participate in decision making or to exert any meaningful control over their environments; their attempts to make themselves understood may take great effort and often meet with failure, which is likely to discourage further communicative efforts; and adults may often discourage them from attempting to communicate because this makes their care more time-consuming.

Comparisons between the Bliss and BSL (Makaton) groups revealed only 2 significant differences (see Table 32.1), with significantly more of the Bliss Users attempting to indicate complex desires and to answer questions, when compared with the Makaton Users. These findings may be explained in terms of the Bliss Users' higher cognitive and language comprehension abilities. However, the total 'motivation to communicate' scores of the 2 groups were not significantly different (Bliss group: Mean = 21.20, S.D. = 5.39; BSL (Makaton) Group: Mean = 19.80, S.D. = 6.28; t = 0.76, d.f. = 38).

Means of communicating and transmitting information which may be used by language impaired and physically handicapped individuals include facial expressions, vocalizations, eye and hand pointing, gestures and words, as well as augmentative systems such as signs and symbols. Facial expression is one of the most primitive forms of communication; it may be a spontaneous emotional expression, or used as a means of deliberate transmission of messages, for example smiling to indicate agreement. The use of eye pointing, too, can be a valuable means of communication for severely handicapped individuals who have little or no physical control of other parts of the body. Gesture is often symbolic and so requires a higher level of representational ability, and also more motor control, when compared with eye or hand pointing. Researchers and teachers are coming to recognize the importance of accepting and encouraging multi-modal communication in physically handicapped, nonverbal individuals, by using whatever channels they have available. The extent to which the present subjects used such means for communicative purposes was assessed via ratings on a scale of 0 to 2, with 0 points being awarded where the particular means of communication was never used, 1 point being given where it was used occasionally, and 2 points being awarded where it was used reliably. As can be seen in Table 32.2, facial expression was the most reliably used means of communication for the present group of cerebral palsied children. The remaining communication modes were used with much lower reliability and consistency, and different patterns of use were apparent for the Bliss and Makaton groups. In the Signing group, 70% of the children made frequent use of hand pointing, and a further 25% used hand pointing only occasionally; 60% of the children used vocalizations reliably and a further 40% vocalized occasionally; and 65% of the group used gestures at least occasionally. Only 2 of these children made any use of eye pointing. In contrast, 45% and 30% of the Bliss Users frequently relied on hand and eye pointing, and a further 40% to 45% used pointing occasionally. Very few of the Bliss Users used vocalizations or gestures with any consistency.

Table 32.2: Means of Communication Used by the Children in School

	Bliss Users (n = 20)			BSL (Makaton Users (n = 20)			
	Reliably %	Occ. %	Never %	Reliably %	Occ. %	Never %	χ^2
Facial expressions	90	10	0	75	25	0	0.69
Vocalizations	15	85	0	60	40	0	6.83*
Eye pointing	30	40	30	0	10	90	15.60**
Hand pointing	45	45	10	70	25	5	2.56
Gestures	5	40	55	20	45	35	2.75
Signs/symbols	25	70	5	10	75	15	1.35
Words	5	20	75	25	35	40	5.62
Spoken phrases	0	15	85	10	15	75	2.12
Spoken sentences	0	5	95	0	10	90	0.00

These differences can be accounted for by the different levels of physical handicap characterizing the 2 groups. The more severely handicapped Bliss Users were less able to use gestures or vocalizations with any degree of consistency, and in some cases eye pointing was the only quick and effective means of communication available to them (for example to indicate yes/no or to request objects). As expected, 75% of the Bliss Users and 40% of the Makaton Signers were unable to use any spoken language, while only 5% and 25% of the children in the 2 groups had reliable use of at least a few spoken words. Only 25% of the Bliss group and 10% of the BSL (Makaton) group frequently used symbols or signs at school; the majority of children (70% of Bliss Users and 75% of Makaton Users) used the systems only occasionally. The poor use of augmentative systems by these children has already been discussed in earlier chapters, with reference to the children's sign/symbol output in the 30-minute recording sessions.

Generalization of the use of Bliss and BSL (Makaton) in the school setting was further explored by asking teachers/speech therapists to rate the extent to which these augmentative systems were used by the children to answer questions, to ask for objects, to indicate needs and to engage in conversations. Table 32.3 shows that while 85% of the Bliss Users and 55% of the Makaton Signers could indicate symbols or execute signs at the request of an adult, only 50% of the Bliss Users and 15% of the Signers used the system reliably to answer questions, while a further 50% of children in each group could do so occasionally. It is even more disturbing to find that only between 1 and 3 children in each group were rated as using the systems reliably to ask for things or to indicate their needs, and that no children used the systems consistently to engage in conversations with others. Between 30% and 50% of the sample never used the augmentative systems spontaneously for such purposes.

Table 32.3 Communicative Use of Blissymbols and Makaton Signing in Schools

	Bliss Users (n = 20)			BSL (Makaton Users (n = 20)			
	Reliably %	Occ. %	Never %	Reliably %	Occ. %	Never %	χ^2
To indicate a symbol/sign when directed	85	15	0	55	30	15	5.29
To answer questions	50	50	0	15	50	35	10.77*
To ask for objects	5	60	35	10	60	30	0.41
To indicate needs	5	55	40	15	45	40	1.20
To engage in conversations	0	50	50	0	50	50	0.00

Interestingly, Reid (1981) also found that all 16 of the ESN(S) schools she visited to gather data on the use of BSL (Makaton), reported extreme difficulty in getting children to use signs spontaneously. Similar problems in fostering spontaneous usage of signs and symbols have been noted in many training studies (see Chapter 11).

The above findings on the modes of communication used by the children further bear out Harris's (1982) conclusions that even where nonverbal children were being taught to use augmentative systems, they primarily used those communicative modes that were most accessible to them, required the least amount of physical effort, resulted in the fastest message transmission, and with which they were most comfortable; namely facial expressions, pointing and vocalizations. Yet, while these modes are undoubtedly efficient for communicating simple needs and desires, they are likely to be inadequate and result in ambiguities and misinterpretations when message content is more complex. This was, after all, one of the main reasons for placing these children in augmentative communication programmes in the first place. It would appear that many children have difficulty in making use of the full communicative potential of augmentative systems, at least in the early stages of training.

Restrictions in the children's communicative interactions in general, and in their use of signs and symbols in particular, were further found in terms of the range of people with whom they were said to communicate. The significance of these particular questionnaire items is two-fold. Children who interact with many people may have a stronger desire to acquire communication skills than children who attempt to communicate only with their teachers or parents. Also, psycho-social growth is reflected in a widening scope of interpersonal relations, and communication plays an important part in initiating and maintaining these relations. As can be seen in Table 32.4, general communicative interactions with class teachers and speech therapists

Table 32.4 Communication with Others in School

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Usually %	Occ. %	Never %	Usually %	Occ. %	Never %	χ^2
Speech therapist/teacher	80	20	0	60	40	0	1.07
Other teachers	20	75	5	10	60	30	4.57
Peers	10	85	5	35	40	25	8.81*
Strangers	15	45	40	0	50	50	3.28

were quite frequent. Interactions with other school staff, with peers and strangers were much less frequent; only between 0% and 30% of children interacted with such persons with any degree of consistency. But over two-thirds of the children did interact with peers and other adults at least occasionally, and approximately half of the children interacted with strangers on occasion. Communicative interactions using signs and symbols were even more restricted (see Table 32.5). Only 15% of children used augmentative communication consistently even with their speech therapists and teachers, although 85% of Bliss Users and 70% of Signers used the system occasionally in interactions with their teachers. The great majority of children did not use the systems at all with other school staff, peers or strangers. Thus, with very few exceptions, the use of signs and symbols failed to generalize to people other than the children's class teachers and speech therapists.

Table 32.5: Use of Bliss and Makaton with Others in School

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Usually %	Occ. %	Never %	Usually %	Occ. %	Never %	χ^2
Speech therapist/teacher	15	85	0	15	70	15	3.29
Other teachers	0	45	55	5	25	70	2.50
Peers	0	5	95	5	30	65	5.70
Strangers	0	15	85	0	20	80	0.00

The comparatively greater primary communication with class teachers and speech therapists may be the result of the children's dependence on these adults for physical and daily living skills, the amount of time they spend with them in teaching and therapy sessions, or their need for a skilled message receiver who can formulate and develop the conversational exchange (Harris, 1982). Proponents of Blissymbolics claim that since Blissymbols always appear with their corresponding English words, the Bliss User can communicate with anyone, and the message receiver is not required to learn Bliss. On present evidence, however, this apparent advantage for Bliss was not found to operate in practice, since communicative interactions using Bliss with other teachers, peers and strangers seldom took place. Moreover, despite differences between the symbol and sign modalities, and despite the Bliss group's greater cognitive and linguistic skills, there was only one significant difference between the 2 groups, and this difference favoured the BSL (Makaton) group. Significantly more Makaton Signers were rated as 'frequently' communicating with peers. This may be explained in terms of the Signing children's comparatively greater physical abilities and speech skills, which allowed them more opportunities to interact with peers.

In sum, the present data reveal a poverty of communicative interactions among the language handicapped, cerebral palsied children comprising the present sample, and considerable restriction on generality of use of the augmentative systems in the schools.

As already discussed with reference to the analysis of the children's symbol and sign language samples, the reasons for the present findings are manifold. They are likely to rest partly in the training provided to these children, partly in the nature of the augmentative systems taught, and partly in the characteristics and handicaps of the children themselves. As Yoder and Kraat (1983) point out, such children have little opportunity to manipulate or regulate their environments, with resulting lack of knowledge or experience of the meaning and power of communication. Their needs are typically anticipated by others, while the history of failure in interactions and in attempts at being understood may be pervasive. A dulling effect on the child's motivation to communicate is likely to follow, and as a result, there will be reduced opportunities and therefore poor development of interactive and communicative behaviours. To give just one example, the limited extent to which the present subjects expressed needs, particularly using Bliss and BSL (Makaton), is likely to be due to the fact that activities such as toileting and feeding are carried out routinely at school, so the children have no pressing need to communicate about them.

Turning to consider the augmentative systems themselves, the unusualness of such systems, and the requirement that other people learn them (particularly in the case of signs), will reduce the number of interactants with whom a non-speaker can communicate. Blissymbolics will further isolate nonreading peers, unless they have specifically been taught the system. The frequent need for interpretation and expansion by the message receiver of the sign or symbol user's utterances, through a series of questions and shared knowledge, will also have the effect of limiting the number of interactants to persons who are familiar with the system user; while the slow rates of sign and symbol transmission may well discourage even familiar people from engaging in frequent and lengthy communicative interactions with the aid user. Kiernan (1983c) has pointed out that problems in generalization have also to be interpreted in the context of potential problems of staff and parent resistance to the use of augmentative communication systems. Little generalization can be expected if those within the child's natural environment are unwilling to approve of and use the augmentative mode. This issue will be elaborated upon in Chapter 33.3.

Another important factor that may help to account for the poor use of Bliss and Makaton Signing, as revealed in the teacher questionnaires, is the relatively low exposure to sign and symbol communication which the children received in school. The Bliss and BSL (Makaton) groups were receiving an average of only 1½ hours of augmentative communication training per week, and, with the exception of only 1 Makaton User, no child received continuous exposure to simultaneous communication throughout the school day (see Chapter 24). It is thus not surprising that the use of Bliss and BSL (Makaton) was largely restricted to communications with class teachers and speech therapists, and to tasks involving the indication of signs or symbols on request and responding to questions posed by adults. Generalization of sign and symbol use needs to be programmed by providing instruction across a variety of situations and interactants, and augmentative communication needs to be modelled and reinforced in naturally occurring situations, indeed throughout the child's day, if greater frequency of use is to be achieved.

33.2 The Children's Communicative Abilities and Use of Bliss/Makaton at Home

The parents' ratings of their children's motivation to communicate yielded a very similar picture to the results obtained on the teacher questionnaires. As can be seen in Table 33.1, between 70% to 100% of the children were rated as frequently obtaining the attention of adults, watching other people, and asking for objects or activities; the remaining children performed these communicative activities occasionally. The majority of children were also said to draw adults' attention to things, and to express greetings and affection at least occasionally. However, as was found in the teacher questionnaires, many fewer children were rated as being able to express complex desires, answer questions and initiate spontaneous communications. According to the parents, between 30% and 60% of the Bliss and BSL (Makaton) groups did not perform these activities at all. Despite

Table 33.1: Parent Ratings of the Children's Motivation to Communicate

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Usually %	Occ. %	Never %	Usually %	Occ. %	Never %	χ^2
Gets adult attention	100	0	0	90	10	0	0.53
Watches other people	80	20	0	70	30	0	0.13
Asks for obj.s/activities	100	0	0	80	20	0	2.50
Draws attention to things	60	35	5	65	15	20	3.44
Expresses affection	80	20	0	80	15	5	1.14
Expresses greetings	50	50	0	75	25	0	1.71
Indicates complex desires	40	30	30	45	20	35	0.54
Answers questions	30	35	35	25	35	40	0.16
Engages in 2-way interactions	40	50	10	45	40	15	0.48
Communicates spontaneously	20	40	40	5	35	60	2.67

the differences between the Bliss and BSL (Makaton) groups in terms of physical, cognitive and language skills, no significant differences between the groups emerged on the parent ratings of these items. There were also no significant differences between the 2 groups on the total 'motivation to communicate' scores reported by the parents (Bliss group: Mean = 23.60, S.D. = 4.64; BSL (Makaton) group: Mean = 22.25, S.D. = 5.92; t = 0.80, d.f. = 38). Significant correlations were found between the 'total motivation to communicate' scores yielded by the parent and teacher ratings (tau = 0.54, P = .007; tau = 0.63, P = .001). However, it is interesting to note that in each group, the total 'motivation to communicate' score obtained from the parents' ratings was significantly greater than the total 'motivation to communicate' score yielded by the teacher ratings (t = 2.22, d.f. = 19, P = .039; t = 2.10, d.f. = 19, P = .050). It is possible that the parents were overestimating the frequency of their children's communicative attempts. However, it must also be recognized that at home the children had the advantage of greater time and attention devoted to them by receptive and familiar adults (i.e. the parents), and it is therefore quite likely that the children responded with more frequent communicative attempts in the home than in the classroom.

Table 33.2 presents the parent ratings of the extent to which

Table 33.2: Means of Communication Used by the Children at Home

	Bliss Users (n = 20)			BSL (Makaton Users (n = 20)			
	Reliably %	Occ. %	Never %	Reliably %	Occ. %	Never %	χ^2
Facial expressions	90	10	0	90	5	5	1.33
Vocalizations	50	45	5	65	25	10	1.87
Eye pointing	65	10	25	5	0	95	20.45**
Hand pointing	50	35	15	90	5	5	7.79*
Gestures	30	30	40	40	35	25	0.16
Signs/symbols	20	55	25	50	40	10	3.73
Words	20	35	45	40	40	20	3.32
Spoken phrases	5	15	80	25	15	60	3.23
Spoken sentences	0	5	95	10	10	80	2.59

their children used facial expressions, vocalizations, pointing, gestures, augmentative systems and speech, for communicative purposes. Facial expression, which is one of the most primitive means of communication, was said to be used reliably and consistently by 90% of the children in each group, and almost all of them also used hand pointing and vocalizations at least occasionally. As was the case on the teacher questionnaires, the parents too rated gestures, speech and signs/symbols as being used much less frequently. Significantly more Bliss Users than Makaton Users made frequent use of eye pointing for communication, while significantly more Makaton Signers relied on hand pointing. These differences were no doubt due to the different levels of physical handicap characterizing the 2 groups. Comparisons between the parent and teacher questionnaires suggest that more of the Bliss Users' parents were inclined to rate their children as making frequent use of vocalizations, eye pointing, gestures and single words, when compared with the ratings made by teachers. Similarly, in the BSL (Makaton) group more parents than teachers rated the children as making frequent use of such means of communication as hand pointing, signing and spoken words. As was explained with regard to the 'motivation to communicate' ratings, these differences may well be due to the greater receptivity of parents to their children's communicative attempts. However, one cannot dismiss the possibility that the parents were overestimating their children's communicative skills.

Parent's ratings of the children's use of signs and symbols for communicative purposes are presented in Table 33.3. These data reveal extremely poor communicative use of Blissymbols and Makaton Signing at home. There were no significant differences between the 2 groups on any of these items. While 75% of the children were said to indicate symbols or execute signs on request at least occasionally, between 40% and 65% of the children never used augmentative communication to answer questions, to ask for things, to indicate needs or to engage in

Table 33.3: Use of Blissymbols and Makaton Signing at Home

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Reliably %	Occ. %	Never %	Reliably %	Occ. %	Never %	χ^2
To indicate a symbol/ sign when directed	65	10	25	50	25	25	1.68
To answer questions	35	25	40	20	40	40	1.51
To ask for objects	10	25	65	25	25	50	1.68
To indicate needs	15	20	65	30	25	45	1.84
To engage in conversations	5	30	65	10	35	55	0.58

conversations. Furthermore, while general communicative interactions with parents were very frequent (see Table 33.4), only 20% of Bliss Users and 40% of BSL (Makaton) Users frequently used their augmentative systems when interacting with their parents, and 40% of Bliss Users and

Table 33.4: Communication with Others at Home

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Usually %	Occ. %	Never %	Usually %	Occ. %	Never %	χ^2
Parents	90	10	0	90	10	0	0.00
Other adults	40	40	20	35	45	20	0.13
Peers	25	45	30	30	35	35	0.42
Strangers	25	25	50	20	45	35	1.78

25% of Signers never used the systems with their parents (see Table 33.5). It is interesting to find similar figures for parental use reported in Kiernan, Reid and Jones' (1982) survey of special schools. They found that between 12% and 41% of mothers did not use signs and symbols with their children who were learning these sytems at school. Augmentative

Table 33.5: Use of Blissymbols and BSL (Makaton) With Others at Home

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 20)			
	Usually %	Occ. %	Never %	Usually %	Occ. %	Never %	χ^2
Parents	20	40	40	40	35	25	2.09
Other adults	0	20	80	10	35	55	3.74
Peers	0	10	90	5	40	55	6.29*
Strangers	0	0	100	5	25	70	7.06*

communication interactions with other adults, peers and strangers were even more restricted, particularly among the Bliss Users (see Table 33.5). These restrictions in the use of signs and symbols in the home and with people outside the home, again confirm the results on the teacher questionnaires (see Tables 32.3 and 32.5) of poor generalization of the systems outside of formal teaching sessions. Interestingly, significantly more Makaton Signers than Bliss Users were said by parents to use the augmentative system in interactions with peers and strangers. These findings are rather surprising, since it is unlikely that people outside the home were acquainted with BSL (Makaton) signs. These results are more likely to reflect greater <u>one-sided</u> communication from the Makaton Signers, rather than meaningful two-way interactions with peers and strangers. In other words, being less physically handicapped and more mobile, the Makaton Signers may have been seen by parents to sign <u>at</u> other individuals, but without such signing necessarily being understood by others or reciprocated. Bliss Users typically depend on interactants to look at their charts and to interpret and expand on their symbol utterances; as can be seen in Table 33.5, such interactions seldom occurred.

The low rates with which the children used the augmentative systems with their parents are particularly disturbing. This issue, and the question of parental attitudes to Blissymbol and BSL (Makaton) use, will be explored in greater detail in the next section.

33.3 Parents' Attitudes to the Use of Blissymbolics and Makaton Signing

As described above, parents' responses to the questionnaires revealed extremely poor use of Blissymbols and BSL (Makaton) by their children. On the basis of these responses, the writer made a subjective summary assessment of the extent to which the systems were used in the home. This rating was on a 4 point scale, ranging from 'no use' to 'frequent use' of signs/symbols in the home. Results on this summary measure are presented in Table 34.1. No Bliss Users, and only 2 Makaton Signers, received frequent exposure to augmentative communication

Table 34.1: Investigator's Rating of Extent of Sign/Symbol System Use in the Home

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	n	%	n	%
Frequently	0	0	2	10
Occasionally	7	35	10	50
Seldom	6	30	3	15
Never	7	35	5	25

in the home environment; 35% of the Bliss Users and 50% of the Makaton Signers received occasional exposure to the systems at home, while a further 30% of the Bliss Users and 15% of the Signers received very limited exposure to the systems. The 2 systems were not used at all in the homes of 7 Bliss Users (35%) and 5 Makaton Signers (25%). There was no significant difference between the 2 groups of children on this measure ($\chi^2 = 3.87$, d.f. = 3). Thus, few parents made serious or consistent efforts to use the systems at home. It will be recalled that at school, too, there was little exposure to Bliss or Makaton Signing outside of formal teaching sessions. These figures give cause for concern since little progress in, and generalization of, sign and symbol use can be expected if these communication systems are not incorporated into the children's daily environments at home as well as in school, and if adult models of system use are not consistently available. Especially in the Bliss Users group one would have expected greater use of the system by parents and others, since, in theory at least, the provision of English 'translations' printed below the symbols renders it unnecessary for people coming into contact with a Bliss User to have learned the system.

The present data point to an urgent need to probe further into factors affecting the adoption of augmentative systems by families, and to examine the question of how effectively the use of signs and symbols is 'sold' to parents by speech therapists or teachers. The acceptability of augmentative communication to the families of system users is likely to be a crucial determiner of the extent to which the systems are adopted in the home. Yet research on this issue has been minimal. In an attempt to shed light on this question, the present investigator asked parents to rate their attitudes to the use of symbols/signs with their children on a 5-point scale (ranging from 'fully in favour' to 'opposed to their use'), and to elaborate on these ratings by describing their perceptions of the advantages and disadvantages of augmentative communication training. It should be noted at this point that all parents had themselves received tuition in the systems from the children's speech therapists or teachers. In addition, the parents of 3 Bliss Users and 8 BSL (Makaton) Users had attended workshops on the systems at school, and the parents of 4 Makaton Users were continuing to receive tuition in signing for between 2 and 4 sessions a month. Many of the parents also had access to manuals or books about the systems. Thus their poor use of Blissymbols and Makaton Signing could not be attributed to lack of knowledge of the systems.

Parents' ratings of their attitudes to the systems are shown in Table 34.2. Although no parents were 'totally opposed' to the use of the systems with their children, only about half of the parents (50% in the Bliss Users group and 55% in the BSL (Makaton) group) were fully in favour of augmentative system use. A further 20% of parents in the Bliss group and 30% of parents in the BSL (Makaton) group expressed qualified support for the systems, while 30% of the Bliss group parents and 15% of BSL (Makaton) parents expressed uncertainty or were not in favour of the systems. The absence of significant differences between the 2 groups of parents on this measure ($\chi^2 = 4.65$, d.f. = 3) indicates that neither system had greater 'face acceptability' than the other for the families concerned. This finding fails to support the claims made by proponents of sign systems that because signing is faster and 'more natural', and does not involve the use of cumbersome

Table 34.2: Parents' attitudes to the Use of Augmentative Systems of Communication

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
Parents' attitude	n	%	n	%
Fully in favour	10	50	11	55
Some support	4	20	6	30
Indifferent or uncertain	2	10	3	15
Not in favour	4	20	0	0
Totally opposed	0	0	0	0

communication charts, it is likely to be more acceptable to interactants than symbol systems.

The only other study to have sampled parental attitudes to augmentative system use concerned the use of Blissymbolics. Tew, Davies and Fletcher (1980) found that of 108 sets of parents, 66.7% had positive views on Bliss, 16.7% showed qualified support, 9.3% were neutral, while 7.4% had unfavourable attitudes to Bliss. These figures indicate slightly more positive attitudes to the system than those expressed by the present sample of Bliss group parents. However, since Tew et al. did not approach parents directly, but instead relied on teachers' reports of parents' attitudes, the validity of their results is open to question.

In sum, approximately half of the present sample of parents were reluctant to give full approval to Blissymbolics and Makaton Signing. Reasons for these attitudes were sought by asking parents to list what they felt to be the advantages and disadvantages of the use of the systems with their children. The points noted by the parents are listed in Appendix 26. The most commonly cited advantage, mentioned by 70% of parents in the Bliss and BSL (Makaton) groups, was that the systems provided the children with a means of expressing their needs, wishes and thoughts which could be understood by parents and other family members. In this regard, 30% of the parents in each group also noted that the systems helped to relieve the child's frustration, while 30% of Bliss Users' parents and 1 Makaton Signer's parents found that the systems allowed for some communication with people outside the family. Five BSL (Makaton) group parents, but no Bliss Users' parents, felt that the system encouraged speech development, and between 1 and 3 parents noted that signing enhanced the child's motivation to communicate, and that parents' signing facilitated comprehension of spoken messages addressed to the child and promoted eye contact.

The most commonly cited objection to the use of signs and symbols related to parents' fears that the acquisition of an augmentative mode of communication would inhibit the acquisition of spoken language. This concern was mentioned by 45% of the parents in the BSL (Makaton) group and by 30% of parents in the Bliss Users group. A number of parents explained this fear by claiming that if one language was acquired, the child would have no need to learn another language (i.e. speech), while other parents argued that since pointing to symbols or executing signs was 'easier' than speech, the child would become lazy and abandon any efforts to attempt to speak. The second most commonly cited criticism of the augmentative systems, noted by 25% of parents in the Makaton Users group and by 20% of parents in the Bliss Users group, was that the systems were difficult for other people to understand, so that communication was restricted to people familiar with the system (i.e. family members). This point is an accepted limitation of the use of sign systems; however, it is interesting to note that 20% of parents in the Bliss group did not accept the claim that no previous knowledge is required to be able to communicate with a Bliss User. These parents had obviously found that the system could not be readily understood by unfamiliar people wishing to communicate with the child. Additional disadvantages of Blissymbolics which were mentioned by parents were that the system was slow and cumbersome to use (5 parents), that the children's physical handicaps made symbol indication unreliable (2 parents), and that the children were not motivated to use the symbol charts at home and saw the system only as a game or as a tedious academic exercise (4 parents). Three further disadvantages of Makaton signing, each cited by 1 parent, were that the system emphasized the child's handicaps, that it was difficult for the parents to learn, and that the physical requirements of signing made it difficult for the child to learn.

It is now widely accepted that the attitude and involvement of those in the child's environment are likely to consitute major factors in the success of a communication programme. Musselwhite and St. Louis (1982) point out that this may be of even greater importance with regard to augmentative communication modes, since the communication partners must invest more time and effort in learning the communication systems and encouraging the children to use them. The present data indicate that few parents made consistent efforts to use Blissymbolics or Makaton Signing at home, and furthermore that approximately half of them were not fully convinced of the value of the systems for their children. Indeed, even among those parents who said that they <u>were</u> fully in favour of augmentative communication, there were a number who voiced concern about possible negative effects of the systems (for example, that they would inhibit speech development). Clearly, parents are unlikely to encourage their children to use augmentative communication systems if they themselves are not convinced of the need for them and fear that they will interfere with future speech development. The present findings therefore suggest that speech therapists and teachers need to become stronger advocates for these approaches; they need to work very much harder at 'selling' the systems to parents, by demonstrating their beneficial effects and the relative ease with which they can be learned and used. The present writer is not recommending a 'bulldozer-like' approach; on the contrary, teachers and speech therapists must be sensitive to the needs and attitudes of parents. In addition to teaching the child, they must recognize that it is part of the child's programme to educate the parents, and they must be prepared to help the parents to understand and accept the method of communication that is chosen (McDonald and Schultz, 1973).

A number of writers have already given attention to this issue, and several recent publications provide useful suggestions on ways of engaging parents. Silverman (1980) recommends the following approaches: 1. Giving parents reassurance that the teacher will not give up on efforts to improve speech, and that learning augmentative communication is highly unlikely to result in reduced attempts at speech, and may well facilitate speech; 2. Providing parents with information from past research on the impact of augmentative systems, and 3. Acquainting them with demonstrations of success with children using comparable systems. It is also important to bear in mind that because many parents readily understand their child's simple needs, they sometimes fail to realize the importance of the greater degree of self-expression which the augmentative medium can offer. These parents need to be helped to understand the importance of being able to express oneself in a modality that can be readily interpreted by persons who do not know the child well enough to understand idiosyncratic communication efforts (McDonald, 1980a). Teachers can also make use of a variety of programme incentives which have been successfully implemented in other areas in order to increase family participation, for example social pressure and social support (such as signing performance contracts), and reinforcement to family members following specific gains in child performance.

33.4 Correlates of the Child's Motivation to Communicate, Parental attitudes, and Extent of Home Use of Blissymbolics and BSL (Makaton) Signing

In view of the suggested importance of the child's motivation to communicate, and of parental attitudes to and use of augmentative systems, correlational procedures were employed to examine the relationship between these variables and other child characteristics. Confirmation for the relevance of these variables was then sought by examining their relationship with the child's acquisition and use of Blissymbolics/BSL (Makaton) Signing at the time of baseline assessment. The resulting correlation coefficients are presented in Appendix 27.

In both the Bliss and BSL (Makaton) groups, the child's motivation to communicate (as rated by teachers) was significantly correlated with cognitive/perceptual skills on the Pre-symbol Assessment and Columbia MMS (in the Bliss group the correlation with the Columbia Scale was just short of significance), with the language comprehension measures (the EPVT, Reynell Comprehension Scale and comprehension of natural gestures), and with the Symbolic Play Test and the test of expression of natural gestures. These results thus show a positive relationship between the desire to communicate and cognitive/perceptual and representational abilities. In the BSL (Makaton) group, motivation to communicate was also significantly correlated with the number of spoken words the children used, and with motor and verbal imitation. These relationships were not found in the Bliss group, no doubt due to the presence in this group of a number of high ability children who were severely physically handicapped and thus had extremely poor motor and spoken language abilities. Interestingly, the present results further show significant correlations between motivation to communicate and the length of time on augmentative systems and the extent of home and school use of the systems for the BSL (Makaton) group ($\underline{tau}$ = 0.48, $\underline{P} < .05$; $\underline{tau}$ = 0.42, $\underline{P} < .05$; $\underline{tau}$ = 0.34, $\underline{P} < .05$), but not for the Bliss group ($\underline{tau}$ = -0.05; $\underline{tau}$ = 0.28; $\underline{tau}$ = -0.15). This would seem to suggest that the communicative attempts of the lower ability Makaton Signers were more dependent on the time and effort devoted to the use of augmentative communication at home and at school, when compared with the more cognitively and linguistically able Bliss Users.

Turning to consider the relationship between the child's motivation to communicate and the acquisition and use of signs/symbols, significant correlations were found in both groups with the number of symbols and signs learned at the expressive and receptive levels. In the Bliss group, there were also significant correlations with the mean length of symbol utterances produced in the 30-minute recording sessions, with the percentage of LARSP entries at Stage I out of total entries at Stages I-V (the correlation here being in a negative direction), with the number of phrases produced at LARSP Stage III, and with the number of statements produced. In the BSL (Makaton) group, motivation to communicate was significantly correlated with the total number of signed utterances produced during the recording sessions, with the number of phrases entered at LARSP Stage III, and with the pragmatic functions of responses and descriptions. The absence of a greater number of significant correlations may well be due to the small numbers of sign/symbol utterances that were produced. This may also explain the absence of significant correlations with the spoken language samples produced by the children. Table 35 presents the correlations between the children's motivation to communicate and teacher and parent ratings of the extent to which the children used the augmentative systems for communicative purposes and the extent to which they communicated with adults, peers and strangers. Most of these correlations were significant, indicating that the greater the child's motivation to communicate, the more likely he/she was to use signs/symbols communicatively, to communicate with a range of individuals, and to be understood by parents and teachers.

Table 35: Correlations of Motivation to Communicate with Teacher and Parent Ratings of the Children's Communicative Attempts

	Bliss Users (n = 20) tau	BSL (Makaton) Users (n = 20) tau
Teacher questionnaire		
Use of symbols/signs to answer questions	0.59**	0.48*
Use of symbols/signs to ask for objects	0.37*	0.65**
Use of symbols/signs to indicate needs	0.07	0.60**
Use of symbols/signs in conversation with adults	0.60**	0.63**
Communicates with class teacher	0.52*	0.44*
Communicates with other adults	0.20	0.51*
Communicates with peers	0.05	0.62**
Communicates with strangers	0.55*	0.28
Extent to which understood by teacher	0.53*	0.51*
Parent questionnaire		
Use of symbols/signs to answer questions	0.34*	0.28
Use of symbols/signs to ask for objects	0.13	0.28
Use of symbols/signs to indicate needs	0.32*	0.32*
Use of symbols/signs in conversation with adults	0.23	0.40*
Communicates with parents	0.35*	0.18
Communicates with other adults	0.58*	0.15
Communicates with peers	0.36*	0.22
Communicates with strangers	0.29	0.34*
Extent to which understood by parents	0.48*	0.35*

These indications of the importance of motivation to communicate for sign/symbol acquisition and use, even at these early stages of the children's exposure to the systems, have been confirmed in a number of other studies, although these have typically provided few data to substantiate this claim (eg. Lombardino, Willems and MacDonald, 1981; Rittenhouse, 1983; Saya, 1980; Song, 1979). The present findings would suggest that work on motivation should begin with the introduction of an augmentative system, if not before.

In the BLiss Users group, parents' attitude to and use of augmentative communication were significantly correlated with the children's cognitive, representational, motivational and language comprehension skills, and with a number of measures of symbol acquisition and use. These results would seem to suggest that where children were more able in terms of cognitive and language comprehension skills and were therefore more motivated to communicate, parents were more likely to see the value of Blissymbolics in providing an expressive channel for their communicative efforts, and so they were more likely to use Bliss with the child at home. Alternatively, it may be argued that because more able children made greater communicative use of the symbols, parents found the system easier to use in the home and therefore had a more positive attitude towards augmentative communication. The reader is again reminded of the limited ranges of the variables involved, which may well explain the absence of a greater number of significant correlations with the measures of parent attitude and use of the symbol system. In the case of the BSL (Makaton) group, many fewer significant correlations were found, and the pattern of relationships was rather different. The extent to which signing was used in the home again correlated significantly and positively with the child's cognitive level, gestural ability and motivation to communicate, with the length of programme participation, and with the numbers of signs acquired at the receptive and expressive levels. However, the correlations between parents' <ins>attitudes</ins> to the systems and the children's ability levels and use of signs and speech in the recording sessions, were almost all in a <ins>negative</ins> direction (although few of these reached significance). Since the BSL (Makaton) Users were less physically handicapped than the Bliss Users, and had fewer impairments of the oral musculature, the present findings would seem to suggest a tendency for parents of more cognitively and communicatively able signers to be less willing to approve of augmentative communication, probably due to their greater hope for speech development and their belief that all effort should be directed at enchancing these children's spoken language skills. In the Bliss Users group, too, there were negative, although nonsignificant, correlations between the children's spoken language skills and parents' attitude to the use of Blissymbols.

The positive, if modest, correlations that were found between parent attitude and extent of home use of signs and symbols, and the findings of significant correlations between extent of home use and the numbers of signs and symbols acquired by the children, underline the importance of gaining parental cooperation for the use of augmentative communication (see Chapter 33.3). The importance of parental attitude to, and use of, the augmentative systems for the children's subsequent progress in sign/symbol acquisition and use will be examined in a later chapter.

Chapter 34. Social Skills and Behaviural Deviance in the Bliss and BSL (Makaton) Groups

34.1 Social Skills

The children's social skills were rated by parents on the following 4 P-A-C Scales: Eating and Table Habits (9 items), Toileting (7 items), Dressing (11 items), and Socialization (24 items). Marking was by a simple point score, with each item passed scoring 1 point. The items comprising these scales are listed in Appendix 15, while Table 36 presents the mean raw scores and standard deviations obtained by the Bliss and BSL (Makaton) Users on each scale. The limited normative data presented in the P-A-C Manual (Gunzburg, 1977) could not be used for comparative purposes since the samples on which these data were based did not include physically handicapped children. However, it can be seen that both the Bliss and Makaton Users passed only about half of the Toileting and Socialization Scale items that normal children may have been expected to acquire. On the Eating and Dressing Scales, the Makaton Signers again passed approximately half of the items, but the Bliss Users only mastered an average of 1 out of the 9 Eating Scale items and 2 out of the 11 Dressing Scale items, indicating that they required even greater assistance with feeding and dressing. The Makaton group's significantly better performance on these 2 scales is undoubtedly due to the fewer motor handicaps characterizing this group, when compared with the Bliss Users' group. In general, however, it must be recognized that the children's poor performance on these scales is likely to be due

Table 36: Performance on the Self-Help and Socialization Scales of Gunzburg's P-A-C

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)		
	Mean	S.D.	Mean	S.D.	t
Eating and Table Habits	0.90	1.45	4.45	2.35	5.75**
Toileting	4.85	2.18	4.05	2.46	1.09
Dressing	2.25	1.33	4.70	1.66	5.15**
Socialization	12.20	3.90	13.30	3.83	0.90

to a variety of factors, including low developmental levels, the children's physical handicaps (which impair the capacity to explore or to be independent of adult help), the fact that their environments are often so sheltered as not to provide opportunities for learning and practice, and also (with reference to performance on the Socialization Scale) their extremely limited communicative skills. All these factors are likely to result in reduced opportunities for, and poor development of, interactive behaviours and self-help skills.

34.2 Attentional Behaviours

Attending ability was assessed by observing each child for 15 10-second periods while the child was engaged in a teacher-led structured group activity. Six separate categories of activity and attentional behaviour were recorded as 'occurring' or 'not occurring' during each 10-second observation period. A detailed description of the observatinal procedure is given in Chapter 19.4, while the attentional behaviour categories are described in Appendix 14. As can be seen in Table 37.1, Gaze Aversion and Off Task behaviour were rather frequent in the Bliss and BSL (Makaton) Groups, occurring on average in one-third to one-half of the 15 10-second observation periods. These findings would seem to support claims made by other writers of a high prevalence of distractibility and attentional deficits in cerebral palsied children (eg. Holt and Reynell, 1967; Woods, 1957). The other attentional behaviour and activity categories that were rated (Gross Body Movements, Irrelevant Vocalizations, Reaching for Objects and Interference) occurred much less frequently. A partial explanation for this finding may relate to the children's motor handicaps, which may not have allowed for the

<u>Table 37.1: Observation of Attending Ability</u>

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)		
	Mean	S.D.	Mean	S.D.	*t*
Gross Body Movements	1.50	2.19	1.95	2.04	0.67
Gaze Aversion	7.80	3.24	8.50	2.44	0.77
Off Task	5.20	3.19	5.65	2.58	0.49
Irrelevant Vocalizations	0.25	0.55	0.95	1.23	2.32*
Reaching Objects	0.40	1.19	0.90	1.29	1.27
Interference	0.05	0.22	0.30	0.73	1.46

occurrence of such behaviours as reaching for objects and vocalizations, at least in the very severely physically handicapped children. Interestingly, despite the differences between the Bliss and BSL (Makaton) groups on measures of severity of physical handicap, cognitive abilities and language, the 2 groups differed significantly on only 1 of the 6 categories of attentional behaviour and activity. The Makaton Signers emitted significantly more irrelevant vocalizations during the observation periods than the Bliss Users (see Table 37.1). In view of the absence of significant differences between the 2 groups on the other observational measures, it seems likely that this single difference may be due to the fact that the Makaton Signers were significantly less physically handicapped and were more able to produce spoken language in general, when compared with the Bliss Users. When this difference between the 2 groups was re-examined using the analysis of covariance procedure, with severity of physical handicap as a covariate, it was no longer significant ($\underline{F} = 2.518$, $\underline{P} = .121$).

A total attention deficit score for each child was obtained by summing across all 6 behavioural categories and over all the time intervals. As can be seen in Table 37.2, the scores on 4 of the behavioural categories (Gross Body Movements, Gaze Aversion, Off Task and Reaching Objects) correlated significantly with this total score.

Table 37.2: Correlations Between the Individual Attentional Behaviour Categories and the Total Attentional Deficit Score

	Bliss Users (n = 20) tau	BSL (Makaton) Users (n = 20) tau
Gross Body Movements	0.64**	0.44*
Gaze Aversion	0.77**	0.40*
Off Task	0.79**	0.67**
Irrelevant Vocalizations	0.16	0.01
Reaching Objects	0.33*	0.49*
Interference	0.02	0.21

Only the categories of Irrelevant Vocalizations and Interference, which occurred with very low frequencies, did not correlate with the total attentional deficit score. In view of these findings, the present writer decided to use this summed total score in all subsequent analyses.

The Needleman Questionnaire (Needleman, Gunnoe, Leviton et al., 1979) was used to provide an additional measure of the children's classroom behaviour. This questionnaire, which was originally designed to evaluate the effects of childhood exposure to lead, provides a score of undesirable classroom behaviours, and is thought to be particularly sensitive to the child's ability to focus attention in relatively structured class learning situations (Yule, Urbanowicz, Lansdown and Millar, 1984). Scores on the 11-item questionnaire were obtained based on the sum of 1 mark per negative report on each item. Mean scores for the Bliss and BSL (Makaton) groups are shown in Table 37.3. To date the Needleman Questionnaire has only been applied to essentially normal samples of children. Yule et al. used the scale with a group of 166

Table 37.3: Performance on the Needleman Questionnaire

	n	Mean	S.D.
The Present Sample			
The Bliss Users Group	20	4.55	2.09
The BSL (Makaton) group	20	4.85	1.95
Yule et al's (1984) Sample			
Blood lead level (ug/dl) 17 - 32	35	2.63	3.01
Blood lead level (ug/dl) 7 - 10	34	1.53	2.34

normal English children aged 6 to 12 years, and found a (nonsignificant) trend for total scores on the scale to increase with increasing blood lead levels. The mean scores that were found for groups of children with lowest and highest blood lead levels are also presented in Table 37.3. There were no significant differences between the Bliss and BSL (Makaton) Users on the total Needleman score (t = 0.47, d.f. = 38), and both groups obtained significantly higher negative scores even when compared with the 35 children with highest blood lead levels in Yule et al.'s study ($t = 2.78$, $P < .05$; $t = 3.31$, $P < .05$). The behaviour of the present sample of cerebral palsied children was thus rated as significantly more deviant than the behaviour of groups of essentially normal children who were only slightly older than the cerberal palsied sample. These differences may be explained in terms of the severe physical, cognitive and language handicaps characterizing the Bliss and BSL (Makaton) Users, and as such will be elaborated upon below.

34.3 Performance on the Rutter Teacher and Parent Questionnaires

The Rutter Teacher and Parent Questionnaires (Rutter, 1967; Rutter, Tizard and Whitmore, 1970) were used to provide measures of emotional and behavioural disturbance. The percentages of children obtaining deviant scores on these 2 scales are shown in Table 38. On the Teacher Questionnaire, 25% of the Bliss Users and 20% of the BSL (Makaton) Users obtained scores at or above the cut-off of 9 points, which is used to identify children with a high level of reported problem behaviours. Over half of these children (3 Bliss Users and 2 Makaton Signers) were classified in the Neurotic category. On the Parent Questionnaire, 35% of the Bliss Users and 40% of the BSL (Makaton) Users

Table 38: The Proportion of Children Obtaining Deviant Scores on Rutter's Teacher and Parent Questionnaires

	Bliss Users (n = 20)		Makaton Users (n = 20)		Rutter et al.'s (1970) General Sample (%)	Rutter et al.'s (1970) Neuro-epileptic Group (%)
	n	%	n	%		
Teacher Questionnaire						
Deviant score (9 +)	5	25	4	20	7.1	30.6
Neurotic	3	15	2	10	2.5	16.7
Antisocial	1	5	0	0	3.9	5.6
Undifferentiated	1	5	2	10	0.7	8.3
Parent Questionnaire						
Deviant score (13 +)	7	35	8	40	6.8	23.5
Neurotic	4	20	6	30	3.0	11.8
Antisocial	1	5	2	10	2.7	8.8
Undifferentiated	2	10	0	0	1.1	2.9

obtained deviant scores,and again most of these children were classified in the Neurotic category. Schachar, Rutter and Smith (1981) have further identified a hyperactivity factor on the Rutter Scales, defined by adding the scores on 3 questionnaire items on each scale. More recent confirmation for the presence of this hyperactivity factor can be found in a study by McGee, Williams, Bradshaw et al.(1985), in which the Rutter Teacher Questionnaire was administered to 940 7-year-old New Zealand children. Schachar et al.consider hyperactivity to be present when the factor score is 3 or more. Of the present sample of cerebral palsied children, 15% of the Bliss Users and 30% of the BSL (Makaton) Users obtained a hyperactivity factor score of 3 or more on the Teacher Questionnaire, and 20% of the Bliss Users and 30% of the Makaton Signers obtained a hyperactivity factor score of 3 or more on the Parent Questionnaire.

Despite differences between the Bliss and BSL (Makaton) groups on the measures of severity of physical handicap, intelligence and language, there were no significant differences between the groups in terms of subscale diagnosis (i.e. below cut-off, neurotic, antisocial or undifferentiated), nor in terms of the numbers of children classed as hyperactive (for the Teacher Questionnaire χ^2 = 1.57, d.f. = 3; χ^2 = 0.57, d.f. = 1; for the Parent Questionnaire χ^2 2.77, d.f. = 3; χ^2 = 0.13, d.f. = 1). The 2 groups also did not differ significantly on the total raw scores obtained on the Teacher and Parent Questionnaires (t = 0.86, d.f. = 38; t = 1.24, d.f. = 38). The reader is reminded that the 2 groups also did not differ significantly on the Needleman Questionnaire and on 5 of the 6 attentional deficit categories. It is possible that these measures were simply too general to pick up differences within the population of nonverbal cerebral palsied children.

Within each of the Bliss and BSL (Makaton) groups there was only a modest correlation between the total scores on the Parent and Teacher Questionnaires (in the Bliss group tau = 0.50, P = .002; in the BSL (Makaton) group tau = 0.40, P = .010). Comparisons between the Parent and Teacher Questionnnaires revealed significant differences in terms of the allocation of children to the various diagnostic categories and to the 'non-deviant score' category (χ^2 = 27.28, P = .001, χ^2 = 9.06, P = .049). In each group, the Parent Scale selected more children with a deviant score than did the Teacher Scale (see Table 38), and the overlap between the children classified in each diagnostic category was small. Thus, of the 8 Bliss Users scoring above the cut-off on either the Parent or Teacher Scale or both, the parents and teachers agreed on category placement for only 2 of the children. Similarly, of the 9 BSL (Makaton) Users scoring above the cut-off on either scale, the parents and teachers agreed on category placement for only 3 children. The differences in the percentages of children with deviant scores identified on the Parent and Teacher Scales may be attributed in part to the situation-specific nature of the children's emotional and behavioural difficulties (with more deviant behaviours being expressed in the home than at school), and in part to the different standards and comparison groups used to judge disturbance (that is, parents may have compared the child to non-handicapped siblings and peers, whereas teachers saw the child in the context of other physically and/or mentally handicapped children in the classroom).

Overall, however, these results are closely comparable with Seidel, Chadwick and Rutter's (1975) finding that 30% of 5- to 15-year-old children with cerebral palsy or hydrocephalus (mean IQ = 71) obtained deviant Teacher Questionnaire scores, and with the rates of disturbance found in neuro-epileptic children of normal intelligence in the Isle of Wight study (Rutter, Graham and Yule, 1970; Rutter, Tizard and Whitmore (1970) (see Table 38). Since it is known that psychiatric disorders are more frequent in severely mentally handicapped populations (Rutter, Tizard and Whitmore, 1970), the distribution of deviant Rutter Scale scores in the present sample was re-examined after excluding those children with Columbia IQs of 55 or below. This resulted in only a slight decrease in the percentages of Bliss and Makaton Users obtaining deviant scores on the questionnaires; 25% of Bliss Users and 11% of Makaton Users with IQs above 55 still obtained deviant scores on the Teacher Questionnaire, while 31% of Bliss Users and 33% of Makaton Users still scored above the cut-off on the Parent Questionnaire. The rates of disorder reported in the studies of Rutter et al. and Seidel et al., and in the present investigation, are several times higher than the rates reported by Rutter, Tizard and Whitmore for 10- to 12-year-old children in the general population on the Isle of Wight (6.8% on the Parent Questionnaire and 7.1% on the Teacher Questionnaire). Similarly, the percentages of children obtaining a hyperactivity factor score of 3 or more in the present sample (22.5% on the Teacher Questionnaire and 25% on the Parent Questionnaire) are approximately 3 times higher than percentages found by Schachar, Rutter and Smith (1981) for a general sample of Isle of Wight children (8.3% on the Teacher Questionnaire and 9.9% on the Parent Questionnaire), and the figures reported by McGee, Williams, Bradshaw et al. (1985) for a sample of 7-year-old New Zealand children (2.7% of girls and 6.1% of boys on the Teacher Questionnaire). These results provide further confirmation for the high rates of disturbance in attending ability and classroom behaviour found on the Needleman Questionnaire and on observation of the children's behaviour in structured activities. Similar problems of distractibility and emotional disturbance in cerebral palsied children have also been reported by Dunsdon (1952), Floyer (1955) and Oswin (1967).

However, it must be pointed out that the rates of deviance cited by Rutter et al. for normal children on the Isle of Wight were based on children who were older than the present sample (i.e. aged 10 to 12 years). There are very few reports on the use of the Rutter Scales with younger children. Stevenson, Richman and Graham (1985) found a rate of deviance of 22% on the Rutter Teacher Questionnaire for normal 8-year-old children; while McGee, Silva and Williams (1984) found that about 30% of a general sample of New Zealand 7-year-olds were identified by the Parent and/or Teacher Scales as having a high level of reported problem behaviours. These figures are considerably higher than Rutter et al.'s figures for older Isle of Wight children; however the samples on which they are based are closer in chronological age to the present sample of cerebral palsied children, who had a mean age of 6 years.

It would therefore appear that while the present sample still showed higher rates of deviant behaviour than those reported by McGee et al. and Stevenson et al. for normal 7- and 8-year-olds (40% of the present sample of cerebral palsied children were identified on the Parent and/or Teacher Scales as showing deviant behaviours), the differences were not as great as comparison with Rutter et al.'s figures would suggest.

A wide variety of reasons have been suggested for the increased rate of psychiatric disorder in cerebral palsied and other brain damaged children (Rutter, Graham and Yule, 1970). These include the presence of a visible disability, the frustrations inherent in physical restrictions, poor speech and communication resulting in the child being unable to express desires and thoughts adequately, adverse parental reactions to the child's handicap, perceptual abnormalities, low intelligence, community prejudices in relation to the disability, the child's reactions to the disability, and impaired emotional control produced by direct brain dysfunction. In their own study, Rutter et al. found no significant association between severity of handicap and the likelihood of psychiatric disorder; nor was the visibility of the handicap a major factor, in that psychiatric disorder was no more frequent in children with visible handicaps and lesions below the brain stem than in children with other non-neurological disorders but few visible disabilities. Rutter et al. further found that low intelligence alone could not account for the high rate of disorder in these children, since even when they restricted comparisons to children with IQs of 86 and above, the rate of psychiatric disorder was still higher than that in children with other chronic physical handicaps. They therefore concluded that the presence of organic brain dysfunction itself is the main feature associated with the much higher rate of behavioural disturbance in neuro-epileptic children.

34.4 Intercorrelations Among the Measures of Social Skills, Attending Ability, and Emotional and Behavioural Difficulties

The patterns of intercorrelations among the measures of Socialization, observation of attending ability, and the Rutter and Needleman Questionnaires, were virtually identical in the Bliss and BSL (Makaton) Users groups. As can be seen in Table 39.1, scores on the Needleman Questionnaire, on the Rutter Parent (A) and Teacher (B) Scales, and on the Rutter A and B hyperactivity scales, were all significantly if moderately intercorrelated, suggesting that both questionnaires were tapping broadly similar areas of child behaviour. A similar conclusion was reached by Lansdown, Yule, Urbanowicz and Millar (1983; Yule, Urbanowicz,

Table 39.1: Intercorrelations Among Measures of Social Skills, Attending Ability and Behaviour

i) The Bliss Group (n = 20):

	Attention deficits	Needleman quest.	Rutter A total	Rutter A hyperact.	Rutter B total	Rutter B hyperact.
P-A-C Socialization	-0.18	-0.27	-0.09	-0.04	0.07	-0.03
Total attention deficits		0.29*	0.39*	0.17	0.17	0.10
Needleman quest.			0.38*	0.31*	0.50*	0.58**
Rutter A - total				0.33*	0.50*	0.34*
Rutter A - hyperact.					0.06	0.46*
Rutter B - total						0.41*

ii) The BSL (Makaton) Group (n = 20):

	Attention deficits	Needleman quest.	Rutter A total	Rutter A hyperact.	Rutter B total	Rutter B hyperact.
P-A-C Socialization	-0.09	-0.27	-0.17	-0.02	-0.17	0.00
Total attention deficits		0.15	0.04	0.20	0.33*	0.09
Needleman quest.			0.32*	0.31*	0.35*	0.31*
Rutter A - total				0.60*	0.40*	0.33*
Rutter A - hyperact.					0.30*	0.35*
Rutter B - total						0.24

Lansdown and Millar, 1984), who found the 2 scales to be highly related in a group of normal 6- to 12-year-old children. Although Lansdown et al. went on to suggest that the Needleman questionnaire may be particularly sensitive to behaviours related to focussing attention in structured learning situations, this was not borne out in the present results, which revealed no particularly strong association between this scale and the Rutter hyperactivity subscales, nor indeed with the total attentional deficit measure which was based on observation of child behaviour in structured classroom activities. In fact, the present results showed no clear association between the total score based on observation of activity/attention and the Needleman and Rutter Questionnaires (including the Rutter hyperactivity scales), suggesting that, even among severely handicapped, cerebral palsied children, the overactive behaviour measured in observation is specific to the situation, and that attention/activity seems to vary considerably according to measure and to situation.

Rather surprisingly, there was no association between the children's emotional and behavioural difficulties and their levels of social competence. The present writer would have expected to find that those children who were able to interact successfully with others in social settings would also have displayed fewer problems in behaviour. There is no ready explanation for the absence of such an association, but it is possible that the P-A-C Socialization Scale, which was designed for use with mentally handicapped populations, is not an appropriate measure of social competence in physically handicapped and nonverbal children.

Of course it must be remembered that the correlations detailed in Table 39.1 were based on relatively small numbers of subjects (20 children in each group). However, even when the 2 groups were combined, the pattern and sizes of the resulting correlation coefficients remained very similar to the above (see Table 39.2).

Table 39.2: Intercorrelations Among Measures of Social Skills, Attending Ability and Behaviour - The Total Group (n = 40)

	Attention deficits	Needleman quest.	Rutter A total	Rutter A hyperact.	Rutter B total	Rutter B hyperact.
P-A-C Socialization	-0.07	-0.25*	-0.09	0.01	-0.04	0.01
Total attention deficits		0.21*	0.18	0.19	0.23*	0.10
Needleman quest.			0.35*	0.31*	0.41**	0.40**
Rutter A - total				0.48**	0.41**	0.26*
Rutter A - hyperact.					0.22*	0.40**
Rutter B - total						0.34*

34.5 Relationships Between the Rutter, Needleman and Socialization Scales and Other Child Characteristics, Including the Acquisition and Use of Blissymbolics/Makaton Signing

Correlations between the Rutter, Needleman and Socialization Scales and measures of cognitive ability, language and communication, are presented in Appendix 28. Of the 5 measures of socialization, behaviour and attending ability, the Needleman Questionnaire emerged as the measure most consistently related to other child characteristics in both the Bliss and BSL (Makaton) groups. Scores on this scale correlated moderately (and in a negative direction) with measures of cognitive abilities, language comprehension, representational skills, the child's motivation to communicate, and the extent to which the child's communicative attempts were understood by adults. Performance on the Needleman Questionnaire also correlated in a negative direction with the number of signs/symbols acquired by the child, but with no measures of sign/symbol or speech use. It would thus appear that, at least in language impaired cerebral palsied children, this measure of classroom behaviour is to some extent sensitive to general ability levels and language learning, and also to the quality of children's interactions with other people, other than through overt means involving speech, signs or symbols. The total attentional deficit score, based on observation of the child in structured activities, showed a similar pattern of correlations to the above for the Bliss group, indicating that those children obtaining higher scores on tests of cognitive ability and language comprehension, tended also to show better attending ability in structured classroom activities. However, similar significant associations with attending ability were not found for the BSL (Makaton) group. Total scores on the Rutter Scales correlated with very few other variables in the Bliss and BSL (Makaton) groups. This is a rather surprising finding, since one may have expected children with higher levels of cognitive ability and with better communication skills, to show fewer behavioural and emotional difficulties than children with more limited abilities and expressive powers. It must however be borne in mind that at the time of baseline assessment the children still had very limited communicative abilities. This may explain the absence of significant correlations between the Rutter Scales (and also the measures of attending ability and the Needleman Scale) and sign/symbol use at this early stage of augmentative communication training. It is worth pointing out that the absence of significant correlations between the Rutter Parent and Teacher Scales and the measures of severity of handicap and IQ, in the present sample, would appear to provide support for the claim made by Rutter, Graham and Yule (1970) that the presence of physical handicap or of low intelligence in themselves cannot account for the high rates of psychiatric disorder in neuro-epileptic children, and that it is the presence of organic brain dysfunction itself which is the main feature associated with these higher rates of behavioural deviance.

In both groups of children, the P-A-C Socialization Scale correlated positively with the measure of motivation to communicate, and negatively with severity of physical handicap. These findings are as anticipated, since both the socialization and motivation to communicate measures concern positive behaviours and interactions with other people, while physical handicaps inevitably impose restrictions on the ability to interact with others. In the BSL (Makaton) group, the Socialization Scale also correlated significantly with measures of cognitive ability, language comprehension and speech expression. These results too are as expected, since it is generally accepted that social skills, cognitive abilities and language/communication feed into each other. Surprisingly, many fewer correlations with the Socialization Scale were found in the Bliss group. The reason for this is not entirely clear; however, as was suggested in Chapter 34.4, the P-A-C Scale was designed for use with mentally handicapped children and it may therefore have been a less appropriate measure of social competence for the Bliss Users, who were more severely physically handicapped but also more cognitively able than the BSL (Makaton) Users.

In sum, the significant correlations that were found with the measures of behaviour, attending ability and social skills, were almost all in the expected direction, but they were few in number. Furthermore, there was no suggestion of an association between successful communicative use of augmentative systems and better social and behavioural adjustment, at least not in this early stage of the children's exposure to augmentative communication training.

Chapter 35. Reading Attainment in the Cerebral Palsied Sample

The only formal aspect of educational attainment assessed in the present investigation was reading ability. Written word recognition was tested using the Picture Aided Reading Test (P.A.R.T.) (Hamp, 1975). This test is particularly suitable for use with nonverbal children, since performance does not depend solely on verbal expression. Instead, the child can respond by indicating pictures which illustrate the meanings of a series of printed words (see Chapter 19.1). Of the 20 BSL (Makaton) Signers, there were 13 children aged 5 years or over, and 6 children aged 6 years or over. However, all these children were non-readers. In the Bliss Users group, there were 17 children aged 5 years or over, but only 4 of these attained a score on the reading test. The distribution of readers and non-readers by chronological age is shown in Table 40. The 4 readers, who had a mean chronological age of 6 years 2 months (S.D. = 6.95 months), attained a mean reading age of 5 years 6 months (S.D. = 0.96), and were able to recognize a mean of 1.25 words

Table 40: The Distribution of Readers and Non-readers by Chronological Age

	Bliss Users (n = 20)		BSL (Makaton) Users (n = 20)	
	Readers	Non-readers	Readers	Non-readers
Chronological age	n	n	n	n
Below 5.00 years	0	3	7	0
5.00 - 5.11 years	1	5	7	0
6.00 years and over	3	8	6	0

on the P.A.R.T. (S.D. = 0.96). They were thus only at the very beginning stages of learning to read.

Cockburn (1961) and Rutter, Graham and Yule (1970) have confirmed that reading difficulties are much more common in cerebral palsied children than in children in the general population. This can be partly explained by the lower proportion of cerebral palsied children who have average intelligence or above, when compared with the general population. Cockburn found that attainment improved as intelligence increased. In this regard, it must be pointed out that all 4 readers in the present sample had IQs of 70 or above, and that 5 of the 6 Bliss Users who were aged over 7 years but were non-readers, had IQs below 70. On the other hand, 60% of the Bliss Users with IQs above 70 were also non-readers. Similarly, Rutter et al. found that significantly more of the cerebral palsied children on the Isle of Wight (41%), compared with non-handicapped children (6.8%), were retarded in reading by at least 2 years, even when IQ was taken into account. Thus, other factors must also be sought to account for the poor reading attainment found in cerebral palsied samples. These are likely to include perceptual disorders, attentional deficits and language impairment. Difficulties in speech and articulation may themselves also contribute to reading problems, since one would suspect that reading requires a degree of competency in the morpho-phonologic rule system between speech and print. The children's physical handicaps may also be important, in terms of the ability to posture advantageously for focussing when reading.

To explore the role of these factors further, the reading and non-reading Bliss Users were compared on a range of measures, including cognitive and physical abilities, language comprehension and expression, and the acquisition and use of Blissymbols. The results of these comparisons are tabulated in Appendix 29. There were no significant differences between the 2 groups in terms of social class, age or severity of physical handicap. However, as expected, the readers achieved significantly higher scores than the non-readers on tests of cognitive and perceptual abilities (the Columbia MMS and the Pre-symbol Assessment), on measures of language comprehension and representational skills (the English Picture Vocabulary Test, Reynell Comprehension Scale, Symbolic Play Test, motivation to communicate), and on the scales of behavioural deviance and classroom behaviour (the Rutter Parent Scale and Needleman Questionnaire). The readers had also acquired significantly more Blissymbols at the receptive and expressive levels, when compared with the non-readers. These results would seem to confirm the relevance of cognitive, perceptual, behavioural and language comprehension abilities for the acquisition of reading skills. These findings, and the fact that severity of physical handicap was not significantly different in the readers and non-readers, also provide support for Rutter et al.'s (1970) conclusion that the poor reading attainment in cerebral palsied children is unlikely to be due to the physical handicap per se, but rather is associated with the direct effects of brain dysfunction.

Interestingly, the 2 groups were not significantly different on any of the measures of expressive language, including speech skills (the Reynell Expressive Scale, the number of spoken words, speech intelligibility, and the speech recording measures) and the use of Blissymbols in semi-structured conversational settings. These findings, and the poor spoken language of the reading group, suggest that productive experiences with language, and particularly speech and articulation skills, are not vital for the acquisition of early reading skills. Finally, it is worth noting that at the time of baseline assessment the readers had been in Bliss programmes for significantly longer periods than had the non-readers. This result in itself cannot be taken as evidence that training in Bliss fosters reading skills, particularly since the 2 groups did not differ significantly on any of the measures of Blissymbol use. However, the finding is suggestive, and this question will be returned to when considering the long term reading attainment of the Bliss and Makaton Users.

PART VI: FOLLOW-UP OF THE BLISSYMBOL AND BSL (MAKATON) USERS

Chapter 36. The Teaching of Symbols and Signs at Follow-up

There is to date very little information on how language handicapped children progress in their use of augmentative systems of communication over time. One of the aims of the present investigation was therefore to examine the process of sign and symbol acquisition by following the subjects up and sampling across training periods. The children were first assessed after they had been in Blissymbol or BSL (Makaton) training programmes for a mean of 10.5 months (range 1 to 18 months). Thereafter, they were re-assessed on 3 further occasions, at six- monthly intervals, over a total period of one-and-a-half years. Of the 20 Bliss Users and 20 BSL (Makaton) Users who started in augmentative communication training programmes, only 34 were still using augmentative systems by the third follow-up period. The numbers of children for whom the teaching of Bliss/ Makaton was abandoned or supplemented at each follow-up period are shown in Table 41.1. There were a variety of reasons for these changes, and these will be elaborated upon below.

As can be seen in the table, all 20 children in the BSL (Makaton) group continued with sign training at the time of the first follow-up assessment. However by the time of the second follow-up, one year after commencement of the study, the teaching of Makaton was abandoned for 4 of these children, while for 2 further children sign training was supplemented by the introduction of symbol systems (Blissymbolics for 1 child and pictographs for the second child). Six months later, by the time of the third follow-up, the teaching of BSL (Makaton) was abandoned in the case of 2 more children; the child learning Makaton signs and the pictorial system continued to make use of both media, while the child learning BSL (Makaton) and Blissymbols made minimal progress in the use of the symbols, and these were dropped in favour of continued sign training only. Thus, by the third follow-up, and 28 months on average after they had first been included in BSL (Makaton) programmes, only 13 of the 20 children were continuing in sign-only training programmes. Augmentative communication training had been abandoned altogether in the case of 6 children, and in the case of 1 child sign training was being supplemented with a pictorial system. The decision to supplement sign training for this child was made because he was showing little spontaneous use of the Makaton signs, and because his limited motor skills made sign production laborious and unreliable. The decisions to abandon signing with the remaining 6 children were said by teachers to be due to a variety of reasons. Three

Table 41.1: The Numbers of Children Continuing to Use Blissymbols/BSL (Makaton) Over Time

i) The Bliss Users Group (n = 20):

	Baseline	Follow-up I	Follow-up II	Follow-up III
	n	n	n	n
Continuing on Bliss	20	20	20	19
Bliss supplemented by Makaton	0	0	0	1
Bliss abandoned	0	0	0	0

ii) The BSL (Makaton) Group (n= 20):

	Baseline	Follow-up I	Follow-up II	Follow-up III
	n	n	n	n
Continuing on Makaton	20	20	14	13
Makaton supplemented by pictures	0	0	2	1
Makaton abandoned	0	0	4	6

of the children were said to have shown marked improvement in their use of speech, and they themselves spontaneously discarded signing, using signs only occasionally and when necessary to clarify the meaning of spoken messages. For these children signing thus served as a temporary mode of communication until oral skills were developed to the point of effectiveness. Clearly, in these cases augmentative communication training did not hamper the development of speech, and may well have facilitated it. The fourth child moved to a new school which did not use augmentative systems some 8 months after commencement of the study, and as she received little encouragement to sign at home she abandoned the use of signs shortly thereafter. The final 2 children were severely mentally handicapped, with extremely limited hand function, and they were unable to progress beyond the acquisition of a few basic BSL signs, which they rarely used spontaneously. In the case of 1 of these children, the teacher felt that it would be more beneficial to concentrate only on speech training.

These data indicate that signing was eventually found to be inadequate, inappropriate or unnecessary as a means of augmentative communication for at least one quarter of the 20 children in the BSL (Makaton) group - in 2 cases apparently because of the children's limited motor skills, and in 3 cases because of reported improvements in spoken language. At this point it is not possible to say whether the relatively brief exposure of these latter 3 children to signing was in fact unnecessary, and a waste of valuable teaching time, or whether it did serve a purpose in giving a boost to their developing speech skills.

In contrast to the picture in the BSL (Makaton) group, all 20 Bliss Users continued in Blissymbol training programmes throughout the duration of the study (see Table 41.1). In the case of 1 boy, however, symbol training was supplemented by the introduction of a BSL (Makaton) programme shortly after the second follow-up assessment period, and some 2½ years after he was first exposed to symbol training. This child was mobile and found his Bliss chart cumbersome to carry around; in addition, his teachers felt that he was making insufficient spontaneous use of the symbols for communication. Signing was therefore introduced in an attempt to foster greater spontaneous communication by the child, but the teaching of Blissymbolics was also continued.

Information was sought from the speech therapists and teachers of the children continuing in augmentative communication programmes on the amount of sign/symbol teaching they were receiving at follow-up, in terms of weekly teaching time. It will be recalled that at baseline the 20 Bliss Users received an average of 1 hour 49 minutes of weekly symbol teaching time, while the 14 BSL (Makaton) Users who continued in sign training received an average of 1 hour 15 minutes of training per week. As was stated in Chapter 24, these figures indicate relatively low exposure to sign/symbol training, which contrasts sharply with the teaching input given in many of the published augmentative communication training studies, some of which claimed to give their subjects several hours of training per day (eg. Schaeffer, 1980a). Mean weekly teaching times for the 2 groups at each of the 3 follow-up periods are presented in Table 41.2. These figures reveal an equally disturbing picture, with a slight decrease in weekly teaching input over time. By Follow-up III, the Bliss Users were receiving

Table 41.2: Weekly Symbol/Sign Teaching Time at Baseline and Follow-up Assessments (in minutes)

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)	
Occasion	Mean	S.D.	Mean	S.D.
Baseline	108.75	52.19	75.00	33.17
Follow-up I	103.00	57.52	77.86	39.01
Follow-up II	92.50	54.90	59.64	31.22
Follow-up III	96.50	45.45	55.71	37.46

an average of only 1 hour 37 minutes of symbol training per week, while the Makaton Signers were receiving a mean of just 56 minutes of weekly sign teaching. A linear trend analysis was performed on this variable in each of the 2 groups. The linear trend over time was not significant for the Bliss Users group (t = 1.03, d.f. = 19), nor for the BSL (Makaton) group (t = 1.73, d.f. = 13). Moreover, comparison between the 2 groups showed that the difference between the linear trend identified in each group was not statistically significant (t = 0.43, d.f. = 32). In other words, neither group experienced a significantly greater decrease in weekly teaching input over time, when compared with the other. It is difficult to justify the limited amounts of symbol and sign teaching input that were given over the one-and-a-half years of the study. As will be shown in later chapters, most of the 34 children who remained in augmentative communication programmes by the end of the study were still severely handicapped in their communicative abilities, and it is therefore extremely disappointing to find that the amount of training which they received at baseline was reduced (albeit not by statistically significant amounts) at follow-up.

In addition to the relatively low exposure to sign and symbol training per se, the information gathered at baseline further revealed considerable restriction on generality of use of the systems in school settings (see Chapter 24). At each assessment period, speech therapists and teachers were asked to provide information on whether Blissymbols and Makaton Signing were used in formal teaching sessions only, in formal sessions and occasionally at other times as well, during all class lessons, or throughout the school day (including mealtimes, assembly, physiotherapy, etc.). At baseline, only 1 Makaton Signer was exposed to signing throughout the school day; and for one-quarter of both the Bliss and BSL (Makaton) groups, their only exposure to sign/symbol use occurred in the formal teaching sessions. As can be seen in Table 41.3, this picture improved over time, with 25% of the Bliss Users and 42.9% of the Makaton Signers being exposed to augmentative communication throughout the school day at Follow-up III. Significant linear trends were evident on this measure for each of the 2 groups (Bliss group: t = 3.59, d.f. = 19, $P < .01$; BSL (Makaton) group: t = 2.44, d.f. = 13, $P < .05$), indicating significant increases in exposure to sign/symbol use in the school setting over the 4 assessment occasions. There was no significant difference between the Bliss and Makaton groups in terms of linear trend (t = 0.17, d.f. = 32). However, it must be pointed out that by the final follow-up period, 62% of the children were still using the systems wholly or largely in formal teaching sessions only.

Table 41.3: Changes Over Time in the Extent to which Symbols/Signs were Used at School

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Sign/symbol sessions only	25	15	15	10	28.6	0	7.1	14.3
Formal sessions + occ. in class	75	75	70	55	57.1	64.3	47.9	42.9
All classwork	0	0	5	10	7.1	7.1	14.3	0.0
Throughout the school day	0	10	10	25	7.1	28.6	35.7	42.9

Thus, even after a mean of 2½ years of augmentative communication training, teachers and speech therapists failed to achieve the incorporation of signing activities and symbols into the daily environments of over half of the children followed up in this study. Writers in the field have repeatedly argued that it would seem to be crucial to place children in settings where they receive continuous exposure to augmentative system use throughout the day. After all, this would place the symbol/sign user in a situation comparable to that of the normal child learning to talk (Bonvillian and Nelson, 1978). Carlson (1982) elaborates on this point further by highlighting the benefits of incorporating augmentative communication into the child's daily environment, as follows: 1. The child can observe others using the communication system, thus developing a concept of signs or symbols as an acceptable and valued communication method. 2. Speech can be paired with the non-speech communication system to provide a model for attempting phonation along with the signs or symbols. 3. The child learns to receive as well as send information via augmentative means and can observe the function and structure of language in this system. 4. The child can communicate with other augmentative system users because of the practice gained in receiving sign/symbol messages from teachers and other adults. It is clear that most of the present subjects continued to receive relatively low levels of exposure to sign/symbol training and use over the course of the investigation, and that, whatever progress they are found to make in language and communicative abilities, the limits of effectiveness in terms of sign and symbol training have in no way been approached.

While the above findings reveal a small increase in the extent to which signs/symbols were used in schools, and no increase in the amount of training given over time, some noteworthy trends can be identified in terms of changes in the quality of training and the types of teaching techniques that were introduced. At baseline, all speech therapists/ teachers placed great stress on teaching sign/symbol vocabulary items, using such strategies as pairing signs or symbols with objects and pictures, modeling, and physical prompting. Only 65% of the Bliss teachers and 20% of the BSL (Makaton) teachers described actively encouraging their pupils to produce multi-term utterances, and only 20% of teachers made efforts to foster spontaneous use of the systems. Over the follow-up assessment periods, teachers were found to place increasing emphasis on spontaneous use of the sytems and on generalization of signing/symbol use to naturalistic settings. While over half of the teachers still devoted considerable amounts of time to teaching specific vocabulary items at Follow-up III, 85% of the Bliss teachers and 57% of the Makaton teachers now stated that they actively worked on encouraging their pupils to produce sign/symbol combinations in correct order, for example by modeling the use of multi-term utterances, by expanding the children's single sign/symbol utterances, by correcting incorrect orderings, and by eliciting two- and three-term descriptions of pictorial stimuli. Moreover, 55% of Bliss teachers and 57% of BSL (Makaton) teachers stated that they made conscious efforts to foster spontaneous use of the augmentative systems in formal settings,and to encourage generalization of the systems to informal settings, for example by introducing doll play and games requiring the use of signs/symbols, by teaching signs and symbols in natural settings (eg. at mealtimes), and by creating situations where the child could express choice and exert control over events through messages conveyed manually or with symbols. The use of such strategies is laudable, but the impression gained by the present writer was that in most cases they were used only by the trainers themselves (rather than throughout the school), and even then not systematically. In no case was sign or symbol use fully a part of the child's daily environment, which is after all the most effective way to foster generalization of augmentative system use outside of formal training sessions.

The children's progress in language comprehension, acquisition and use of signs/symbols, the use of speech, social and emotional development, and reading skills, will be described in the following chapters. The analysis of changes will be confined to the 20 Bliss Users and 14 BSL (Makaton) Signers who continued in augmentative communication training programmes throughout the course of the study, up to and including the third follow-up assessment period. The statistical procedure adopted will involve an examination of the linear slope component of the change over time in the above measures, in each of the Bliss and BSL (Makaton) groups. Comparisons between the linear trends identified in the 2 groups will then be undertaken, in order to test for differences between the groups in rates of progress over the 4 assessment periods. An alternative way of analysing the data would be to use formal multivariate analysis of variance techniques, which would explore not only the linear component but also other components of changes in the variables over time (cubic, quadratic etc.). However, in view of the large numbers of variables to be analysed, and the relatively small numbers of subjects in each group, it was not considered advisable to carry out too many statistical tests, which would be likely to result in highly inflated error rates. The follow-up analyses were therefore limited to analysis of linear trends only. Examination of the mean scores of the 2 groups on the measures concerned at each follow-up assessment provides some support for this decision, in that both the Bliss and Makaton groups showed continued progress over time on most of these variables.

It is, however, important to introduce a cautionary note at this point, namely that in view of the large numbers of variables involved in assessing changes over time, some results may well be significant by chance alone. In addition, no control group was included in the study. Therefore, whatever changes are evidenced on the tests and instruments used, it will not be possible to conclude that these are the result of enhanced expressive and receptive communication skills which subjects may have gained through their exposure to sign or symbol training. In the case of language, social and emotional behaviours, and other developmental skills, improvements are likely to occur with age. Thus changes in measures not directly related to sign or symbol use <u>may</u> be attributable to the effects of augmentative communication training, but they may also be due, either wholly or in part, to the passage of time and the child's own maturation, to the introduction of a structured training programme per se, or even to the structured, repetitive nature of the assessment instruments that were used.

<u>Chapter 37.</u> <u>Cognitive Abilities, Language Comprehension and Representational Skills at Follow-up</u>

Table 42.1 presents the means and standard deviations of the Bliss and BSL (Makaton) groups on the measures of cognitive ability and visual perception, for each of the 4 assessment periods. The Raven's CPM (Set A) was administered at baseline and final follow-up only, and the mean scores for this measure are thus confined to these 2 assessment periods. Neither group showed a significant change on this measure from baseline to Follow-up III ($\underline{t}$ = 0.64, $\underline{d.f.}$ = 19; $\underline{t}$ = 0.97, $\underline{d.f.}$ = 13). There was also no significant difference between the 2 groups in mean change scores on this

Table 42.1: Means and Standard Deviations on the Cognitive and Perceptual Measures for Each Assessment Period

Measure	Occasion	Bliss Group (n = 20) Mean	Bliss Group (n = 20) S.D.	BSL (Makaton) Group (n = 14) Mean	BSL (Makaton) Group (n = 14) S.D.
Raven's CPM	1	4.60	2.26	2.00	2.15
	4	5.05	2.70	2.57	2.17
Frostig Form Perception	1	57.30	18.18	36.86	9.95
(perceptual age mnths.)	2	50.70	13.83	40.71	10.57
	3	61.65	13.15	45.43	13.67
	4	64.20	14.93	52.29	13.40
Frostig Position in Space	1	49.95	15.43	36.64	9.50
(perceptual age mnths.)	2	60.00	16.77	39.00	12.73
	3	60.45	11.61	44.36	12.85
	4	63.60	13.19	44.57	16.84
Pre-symbol Assessment	1	23.15	5.84	11.07	7.22
	2	24.90	5.21	12.79	6.69
	3	26.40	4.27	13.57	7.30
	4	27.70	3.53	15.21	7.64

measure from baseline to the final follow-up (t = 0.12, d.f. =32). It may be that this test is not sufficiently sensitive to show changes in severely handicapped children over a relatively limited period of time. In contrast, in both groups significant linear trends were evident over time on the Form Perception subtest of the Frostig Test of Visual Perception (Bliss group: $t = 3.43$, $P < .01$; Makaton group: $t = 5.11$, $P < .001$), on the Position in Space subtest of the Frostig (Bliss group: $t = 3.04$, $P < .01$; Makaton group: $t = 3.63$, $P < .01$), and on the Pre-symbol Assessment Task (Bliss group: $t = 5.13$, $P < .001$; Makaton group: $t = 2.45$, $P < .05$; d.f. = 19, 13 in all cases). Comparisons between the 2 groups showed no significant differences in terms of the linear trends identified (see Table 42.2). In other words, neither group showed a greater improvement than the other on any of these 3 measures.

In terms of the extent of improvement, however, the results are not particularly encouraging. Over the 1½ years of the study, the Bliss Users improved by an average of only 7 months and 15 months respectively on the 2 Frostig subtests, and the Makaton Signers improved by an average of only 14 months and 8 months respectively on the 2 subtests; and both groups improved by an average of only 4 points on the Pre-symbol Assessment Test (total possible score 32 points). As has already been pointed out, it is not possible to determine whether these modest improvements should be

Table 42.2: Linear Trends on the Frostig and Pre-symbol Assessment Tests - Comparisons Between the Bliss and Makaton Groups

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)		
	Mean	S.D.	Mean	S.D.	t
Frostig Form Perception	-31.65	41.31	-51.00	37.34	1.40
Frostig Position in Space	-41.40	60.95	-29.14	30.06	0.77
Pre-symbol Assessment	-14.84	12.60	-13.21	20.21	0.28

attributed to the augmentative communication training programmes, simply to the passage of time, or indeed to a combination of both factors.

Turning to consider the children's performance on the measures of language comprehension, Tables 42.3 and 42.4 show the distributions of Reynell Comprehension Language Ages and English Picture Vocabulary Test (EPVT) standardized scores in the Bliss and BSL (Makaton) groups at each of the 4 assessment periods. Raw score means and standard deviations on these measures, as well as on the measures of Symbolic Play, Understanding and Expression of Natural Gestures, and Motor Imitation, are presented in Table 42.5. Significant linear trends were evident over time for both groups on each of these measures, as follows: 1. EPVT raw scores: Bliss group - $t = 6.58$, $P < .001$; Makaton group - $t = 5.61$, $P < .001$. 2. Reynell Comprehension Scale raw scores: Bliss group - $t = 6.79$, $P < .001$; Makaton group - $t = 7.87$, $P < .001$. 3. Understanding of Gestures: Bliss group - $t = 2.54$, $P < .05$; Makaton group - $t = 4.74$, $P < .001$. 4. Expression of

Table 42.3: Distribution of Reynell Comprehension Language Ages Over Time

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
Language Age	1	2	3	4	1	2	3	4
(in months)	%	%	%	%	%	%	%	%
84 or above	5	0	0	20	0.0	0.0	0.0	0.0
72 - 83	5	5	25	5	0.0	0.0	0.0	0.0
60 - 71	10	20	10	10	0.0	0.0	0.0	0.0
48 - 59	15	15	30	40	0.0	7.1	7.1	7.1
36 - 47	55	50	35	25	14.3	28.6	42.9	64.3
24 - 35	10	10	0	0	64.3	57.1	28.6	28.6
13 - 23	0	0	0	0	21.4	7.1	21.4	0.0
12 or below	0	0	0	0	0.0	0.0	0.0	0.0

Table 42.4: Distribution of English Picture Vocab. Test Scores Over Time

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
IQ	%	%	%	%	%	%	%	%
110 or above	0	0	0	0	0.0	7.1	7.1	7.1
90 - 109	30	15	15	15	0.0	0.0	0.0	0.0
70 - 89	30	35	35	30	14.3	14.3	7.1	7.1
64 - 69	0	15	5	15	7.1	21.4	7.1	0.0
63 or below	40	35	45	40	78.6	57.1	78.6	85.7

Gestures: Bliss group - $t = 5.50$, $P < .001$; Makaton group - $t = 5.65$, $P < .001$. 5. Motor imitation: Bliss group - $t = 3.84$, $P < .01$; Makaton group - $t = 3.59$, $P < .01$; d.f. = 19, 13 in all cases). These trends indicate that all 5 measures of language comprehension and use of natural gestures tended to increase over the 4 assessment periods for subjects in both the Bliss and BSL (Makaton) groups. The Symbolic Play Test, like the Raven's CPM, was administered at baseline and Follow-up III only. While the BSL (Makaton) group showed a significant positive change on this measure from the first to the final testing periods ($t = 2.76$, d.f. = 13, $P < .05$), the Bliss group did not ($t = 1.31$, d.f. = 19, n.s.). However, it must be pointed out that even at baseline, the Bliss Users achieved scores near the ceiling of this test (maximum possible score 24 points).

Examination of Table 42.5 shows that both groups evidenced substantial raw score gains over time on the measures of Understanding and Use of Natural Gestures, with the Bliss group achieving a mean score for Gestural Understanding at Follow-up III which was just slightly below the ceiling of the test. The only norms available for this test are those provided by Bartak (1977) for groups of autistic and dysphasic children. Bartak's 2 groups achieved mean scores of 10.88 and 15.05 respectively for Gestural Understanding, and mean scores of 11.25 and 16.78 respectively for Expression of Natural Gestures. By Follow-up III the present Bliss Users thus achieved a similar mean score on Gestural Understanding to that attained by Bartak's dysphasic group (i.e. close to the ceiling of the test), while the Makaton group's mean score on this measure was midway between the mean scores of the autistic and dysphasic samples. Moreover, despite the present subjects' severe physical handicaps, they attained considerably higher mean scores at Follow-up III on the Test of Gestural Expression, when compared with Bartak's samples.

Table 42.5: Means and Standard Deviations on the Measures of Language Comprehension, Symbolic Play and Use of Gestures at Each Assessment Period

		Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)	
Measure	Occasion	Mean	S.D.	Mean	S.D.
Reynell Comprehension Scale	1	46.55	9.56	27.50	10.21
(raw score)	2	47.90	7.72	32.43	9.76
	3	51.65	6.82	35.29	11.53
	4	52.50	6.86	37.71	10.31
English Picture Vocab.	1	16.95	14.37	5.07	6.84
Test	2	18.90	13.11	8.50	8.30
	3	21.85	14.50	8.57	7.20
	4	25.50	14.16	10.79	7.78
Symbolic Play Test	1	21.20	4.40	15.29	6.29
(raw score)	4	22.15	2.37	17.93	4.80
Understanding of Gestures	1	13.40	3.71	8.36	5.17
	2	14.85	1.57	10.71	4.53
	3	15.26	0.93	11.50	3.90
	4	15.10	1.21	12.86	3.37
Expression of Gestures	1	20.20	7.70	14.64	10.08
	2	22.80	7.60	19.86	9.15
	3	25.00	5.22	21.43	8.20
	4	26.75	5.79	24.29	6.32
Motor Imitation	1	4.90	2.61	5.50	3.44
	2	6.60	2.11	7.00	3.64
	3	6.75	2.49	7.36	3.00
	4	6.90	2.86	8.00	3.09

The children showed rather less improvement on the test of Motor Imitation, although the linear trends identified on this measure were significant in both groups. By Follow-up III, the 2 groups achieved mean scores of 6.90 and 8.00 respectively on this measure, out of a possible total score of 16. These results contrast sharply with Butler's (1971) finding that 81% of 440 normal 4- and 5-year-old children achieved scores of 11 or above on this test (see Table 15.5), suggesting that even after an average of 28 months of augmentative communication training, the cerebral palsied children remained severely impaired in motor imitation ability. Imitative skills require finely coordinated motor movements, and the children's severe motor handicaps would clearly limit any progress that could be achieved in this area.

Persisting deficits were also found on the tests of language comprehension. While both the Bliss and Makaton Users demonstrated significant improvements on the Reynell Comprehension Scale and EPVT over time (see above), they continued to show substantial receptive language impairment. At baseline the sample had a mean chronological age of 6 years 0 months, and the median Reynell Comprehension Ages achieved were between 3 and 4 years for the Bliss group, and between 2 and 3 years for the BSL (Makaton) group. By the time of the final follow-up assessment, when the sample had a mean chronological age of 7 years 6 months, only 5 children (all Bliss Users) obtained Reynell Comprehension Language Ages of 7 years or above (see Table 42.3). The median Language Age for the BSL (Makaton) group was between 3 and 4 years, and the median Language Age for the Bliss group was between 4 and 5 years. Progress on the EPVT, which is a test of receptive vocabulary and provides standardized scores (i.e. taking the child's chronological age into account), was equally disappointing. The distribution of standardized scores over time shows little change in the children's <u>relative</u> standing on this measure (see Table 42.2). At baseline 85.7% of the Makaton Signers and 40% of the Bliss Users obtained standardized scores of 69 or less on this test, while 18 months later these percentages were 85.7% and 55% respectively.

To sum up, the present findings indicate that while both the Bliss and BSL (Makaton) Users showed significant improvements over time on the measures of language comprehension, symbolization and understanding and use of gestures, the actual progress made was not substantial; and despite their exposure to augmentative communication training, the majority of children continued to show severe impairments in these areas by Follow-up III. It is worth noting at this point that the few published studies which have reported follow-up data on subjects trained in sign use (albeit over shorter time intervals), also found rather limited progress on formal tests. Benaroya, Wesley, Ogilvie et al. (1977, 1979) found some improvement in mean Columbia Scale scores after a 5-month signing programme, but no change on the Peabody Picture Vocabulary Test. Bonvillian and Nelson (1976) found a 17-month improvement on the Peabody Test in the first 6 months of a signing programme with their autistic subject, but post-testing was conducted with ASL signs and speech. Konstantareas, Webster and Oxman (1979) found some qualitative gains in their autistic subjects after 9 months of sign training, in terms of test-taking skills and interest in tasks, but few quantitative gains on their tests of language and IQ. And Bailey and Tait (1979) found a mean gain of only 2.06 months on the Reynell Comprehension Scale in 5 severely mentally handicapped children who received 12 months of training in BSL (Makaton) Signing. As already explained, the absence of control groups in these studies, as in the present investigation, means that it is not possible to assess the extent to which the modest improvements found are due to the children's own maturation and/or to sign/symbol training.

Comparisons between the Bliss and BSL (Makaton) groups in terms of their rates of progress on the above measures are presented in Table 42.6. There were no significant differences between the 2 groups in the

Table 42.6: Linear Trends on the Measures of Language Comprehension and Use of Gestures - Comparison Between the Bliss and Makaton Groups

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)		
	Mean	S.D.	Mean	S.D.	t
Reynell Comprehension Scale	-21.60	14.23	-33.50	15.93	2.29*
English Picture Vocab. Test	-28.60	19.43	-17.21	11.48	1.96
Understanding of Gestures	- 5.84	10.00	-14.29	11.28	2.27*
Expression of Gestures	-22.74	18.03	-30.50	20.19	1.16
Motor Imitation	- 6.15	7.17	- 7.86	8.20	0.64

linear trends identified on the EPVT, the Expression of Natural Gestures and Motor Imitation Test. The absence of significant differences in progress on Gestural Expression and Imitation is particularly surprising. Since signing is much more a language of the body than spoken language or the use of symbols, the BSL (Makaton) Users might have been expected to be more attuned to body language and so improve more on these tests, when compared with the Bliss Users. Possible explanations for the present findings may be that the items on these tests do not relate specifically to the postures and movements used in signing, that neither symbol nor sign training contributed to the progress found on these tests (i.e. progress was due to the children's maturation), or that both training programmes had an impact on the skills assessed by these tasks. There was also no significant difference between the groups in terms of the mean change scores on the Symbolic Play Test from baseline to Follow-up III (t = 1.43, d.f. = 32). On the other hand, the BSL (Makaton) group showed significantly greater improvement on the Reynell Comprehension Scale and Comprehension of Gestures Task over time, when compared with the Bliss group. The reasons for this are not entirely clear. Certainly, the 2 groups were exposed to different types of augmentative communication training programmes, and this might lead one to argue that sign training facilitates greater progress in language comprehension and gestural understanding than does Blissymbol training; perhaps because in the former type of programme verbal input to the child is accompanied by simultaneous sign input (i.e. additional visual cues), whereas in Bliss programmes adults often use speech only, when communicating with Bliss Users. However, the 2 groups were also significantly different at baseline in terms of IQ, language comprehension and severity of physical handicap, and any of these differences could well account for the differential improvement rates that were found. Indeed, when the differences in linear trend on these 2 measures were re-examined, using IQ and severity of handicap as covariates, they were no longer significant ($F = 0.18$, $P = .67$; $F = 1.05$, $P = .31$), suggesting that they could be fully explained by the effects of the 2 covariates.

Thus, once baseline differences between the 2 groups were taken into account, neither system of augmentative communication (signs or symbols) fostered greater improvement than the other on any of the measures of cognitive ability, visual perception, language comprehension, symbolic play, or even the understanding and use of gestures. This conclusion, and the earlier findings that neither system resulted in a greater degree of conversational use of augmentative communication at baseline (see Chapter 27), suggest that neither system has an advantage over the other - at least in terms of its impact on the variables examined thus far. Comparisons between the sign and symbol users in terms of progress on other measures will be discussed in later chapters.

Chapter 38. The Numbers of Symbols/Signs Acquired Over Time

Table 43.1 presents the mean numbers of signs and symbols the children had been taught by the time of each assessment period, as well as the mean numbers and percentages of signs/symbols acquired over time at the receptive and expressive levels. Significant linear trends were identified in each group on the following variables: the number of symbols/signs taught (Bliss group: $t = 5.13$, $P < .001$; Makaton group: $t = 3.80$, $P < .01$), the number of symbols/signs understood (Bliss group: $t = 4.95$, $P < .001$; Makaton group: $t = 4.93$, $P < .001$), and the number of symbols/signs indicated or produced on request (Bliss group: $t = 4.82$, $P < .001$; Makaton group: $t = 4.39$, $P < .001$; $d.f. = 19, 13$ in all cases). The results thus show a steady improvement over the 4 assessment periods in the numbers of vocabulary items taught, understood and produced in each of the Bliss and BSL (Makaton) groups. At the time of baseline assessment the Bliss Users and Makaton Signers had been in training programmes for an average of 10½ months, and

Table 43.1: Numbers of Symbols/Signs Taught, Understood and Produced Over Time

Measure	Occasion	Bliss Group (n = 20) Mean	S.D.	BSL (Makaton) Group (n = 14) Mean	S.D.
No.of symbols/signs taught	1	68.80	56.41	66.86	39.57
	2	96.00	56.82	80.79	42.18
	3	115.45	54.55	90.43	46.59
	4	137.85	82.89	100.29	52.66
No.of symbols/signs understood	1	54.00	47.31	35.43	28.48
	2	80.58	51.42	55.00	34.89
	3	95.45	50.79	64.71	39.56
	4	113.65	70.50	72.07	46.10
% of symbols/signs understood	1	70.10	23.10	46.93	31.30
	2	74.42	22.68	56.57	25.49
	3	77.85	21.29	58.57	27.26
	4	77.25	18.83	60.36	27.94
No.of symbols/signs produced	1	50.60	42.94	31.21	28.87
	2	77.58	51.43	49.93	35.98
	3	93.45	49.80	62.29	43.82
	4	108.95	69.92	65.14	46.17
% of symbols/signs produced	1	76.70	16.85	40.71	23.13
	2	76.58	17.61	58.57	20.85
	3	81.45	16.25	63.29	22.18
	4	79.10	15.48	62.50	21.67

had been taught a mean of 68.80 Blissymbols and 62.85 Makaton Vocabulary signs respectively. By the third follow-up period, and 28 months on average after they had first been placed in augmentative communication programmes, they had been taught a mean of 137.85 symbols and 100.29 signs respectively. The numbers of vocabulary items understood and produced more than doubled over this period, rising from means of 54.00 symbols understood and 50.60 symbols indicated to means of 113.65 symbols understood and 108.95 symbols produced in the case of the Bliss group, and from means of 35.43 signs understood and 31.21 signs produced to means of 72.07 signs understood and 65.14 signs produced in the case of the BSL (Makaton) group. Other components of change in the variables over time were not examined statistically (cubic and quadratic trends) because of the danger of inflating error rates as a result of using too many statistical tests. But examination of Table 43.1 suggests that the greatest improvement in the numbers of symbols/signs taught and acquired occurred in the initial 6 months of the study, and changes between Occasions 2 and 4 were less marked, although still substantial. This may be due to the (nonsignificant) reduction in weekly teaching input over time. There was also some improvement over time in the percentages of symbols and signs acquired by the children out of the total vocabulary items taught (see Table 43.1), which is suggestive of a learning to learn phenomenon, i.e. the more symbols or signs the children learned, the easier they found it to acquire new vocabulary items. However, the only linear trend which was significant here was for the percentage of signs correctly produced out of the total number of signs taught (t = 4.76, d.f. = 13, $P < .001$).

These results are quite encouraging. Comparison with other studies is difficult because of the minimal data they typically provide, and because of differences in their training and assessment procedures. But the present findings appear to compare very favourably with the few published reports which detail long-term progress in sign and symbol acquisition. These studies have reported widely varying results. For example, Harris-Vanderheiden, Lippert, Yoder and Vanderheiden (1979) reported acquisition of between 60 and 200 Blissymbols by mentally and physically handicapped children after 30 to 41 months of training. Similarly, Calculator and Dollaghan's (1982) mentally handicapped cerebral palsied children had been taught between 27 and 150 Blissymbols in a 2-year training programme. Miller and Miller's (1973) severely disturbed autistic subjects acquired an average of only 8 signs at the expressive level and 27 signs at the receptive level after between 4 and 36 months of daily training sessions; whereas an autistic child taught by Bonvillian and Nelson (1978) was reported to have mastered over 400 ASL signs in a 3-year training period. It must be pointed out that the present subjects, too, revealed a wide range of individual differences in terms of the number of signs/symbols acquired, with several Bliss Users acquiring over 200 symbols by Follow-up III, but other children mastering only 20 or 30 signs and symbols. Furthermore, the size of the children's vocabulary repertoires in 'real terms' remained extremely limited. By Follow-up III the average vocabulary set in the Bliss group consisted of only 138 symbols, and the average vocabulary set in the BSL (Makaton) group consisted of only 100 signs, whereas normal, speaking 6- and 7-year-old children have vocabulary repertoires consisting of thousands of words. The present subjects (a significant proportion of whom were not mentally handicapped) were thus restricted to communicating with small, finite sets of vocabulary items, which were unlikely to satisfy all their communicative needs. As was pointed out in Chapter 26, Blissymbol strategies can be useful in this regard in allowing symbol users to expand their limited symbol sets. At baseline, only 1 Bliss User was using a Blissymbol strategy, but by Follow-up III 6 of the 20 Bliss Users had learned to use at least one strategy each; 2 of these children were using 4 strategies, and 3 children were using 3 strategies each. These included the use of the ACTION INDICATOR to give symbols a verb meaning; the OPPOSITE MEANING symbol, which signals the intended expression of a thought antithetical to a given symbol; and the COMBINE strategy, which allows for the combination of existing symbols to form new, compound symbols. No such formal strategies for vocabulary expansion are available to BSL (Makaton) Users.

Comparisons between the linear trends identified in the Bliss and BSL (Makaton) groups on the above measures are presented in Table 43.2. The comparisons revealed a significant difference in the linear trend identified for the number of symbols/signs taught, with the Bliss group showing a greater increase in the number of symbols taught over time, when compared with the Makaton group. The Bliss group also showed greater increases than the Makaton group in the number of symbols acquired at the receptive and

Table 43.2 Linear Trends on the Measures of Sign/Symbol Acquisition - Comparisons Between the Bliss and Makaton Groups

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)		
	Mean	S.D.	Mean	S.D.	t
No. of symbols/signs taught	-222.60	197.62	-109.93	108.25	2.21*
No. of Symbols/signs understood	-206.63	181.85	-119.64	90.86	1.80
No. of symbols/signs produced	-203.26	183.98	-114.14	97.34	1.80
% of symbols/signs understood	- 24.05	77.93	- 42.29	109.17	0.56
% of symbols/signs produced	- 10.37	51.60	- 70.07	55.04	3.19*

expressive levels, but these differences were just short of significance. The differences are likely to be explained by the fact that at baseline the Bliss group attained significantly higher scores on the cognitive, perceptual and language comprehension measures that were administered, when compared with the Signing group. The greater weekly teaching input which the Bliss Users received throughout the duration of the study (see Tables 22.1 and 41.2) may also be relevant in helping to account for their greater improvement on the symbol comprehension and production tasks. There was no significant difference between the 2 groups in terms of changes over time in the percentage of symbols/signs understood out of all symbols/signs taught; however, the Makaton Signers showed a significantly greater increase in the percentage of signs acquired at the expressive level when compared with the Bliss Users. At baseline the Bliss Users were found to understand and produce a significantly greater percentage of the total vocabulary items taught than the Makaton Signers. The present result thus indicates encouraging progress by the Signers on this measure.

Given the baseline differences between the 2 groups in IQ, degree of physical handicap and language comprehension, the differences in linear trend detailed above were re-examined with analysis of covariance procedures, using the Columbia MMS, degree of handicap and Reynell Comprehension scores as covariates. When this procedure was used, the significant differences between the groups in terms of changes in the number of signs/symbols taught and percentage of signs/symbols produced, were no longer significant ($F = 0.47$, $P = .50$; $F = 1.56$, $P = .22$). These results would seem to confirm that the differences between the 2 groups in sign/symbol acquisition over time were due to differences in group characteristics, rather than to any differences in the systems themselves (in terms of one system being easier to learn than another). At baseline few differences were found between sign and symbol acquisition and use, and those differences which were significant disappeared when group differences in IQ, language comprehension and severity of handicap were controlled for. The only group difference which persisted at baseline was on the measure of symbol/sign acquisition at the expressive level. This finding indicated that at this early stage of training Blissymbols were easier to learn at the expressive level than were signs. However, the absence of other significant differences between the systems at baseline, together with the present findings, argue against any clear-cut advantages for symbol systems over sign systems. Of course this does not mean that for individual children both systems would be equally effective. Differences in terms of progress in system use over time will be examined in the following chapter.

Chapter 39. The Symbol and Sign Language Samples Produced Over Time

At each of the 4 assessment periods the present investigator obtained recordings of the sign and symbol utterances produced by the children during 30-minute semi-structured conversational sessions. The procedure used to gather these language samples was described in Chapter 19.3.3. At baseline all 20 Bliss Users produced at least one symbol utterance each during the half-hour recording sessions. A language sample could not be obtained for 1 of these children at Follow-up I because he was ill, and his data were excluded from the linear trend analyses over time. The remaining 19 Bliss Users all continued to produce symbol utterances at each of the 3 follow-up assessment periods. Of the 14 BSL (Makaton) Signers, 3 produced no sign utterances at baseline. By Follow-up III, 13 of the Signers produced at least 1 sign utterance each during recordings, but there was still 1 child who produced no sign output (see Table 44.1)

Table 44.1: The Numbers of Children Producing Symbol/Sign Utterances in Recording Sessions Over Time

i) The Bliss Group (n = 20)

	Baseline	Follow-up I	Follow-up II	Follow-up III
	n	n	n	n
At least 1 symbol produced	20	19	20	20
No symbol utt.s produced	0	0	0	0
Missing	0	1	0	0

ii) The BSL (Makaton) Group (n = 14)

	Baseline	Follow-up I	Follow-up II	Follow-up III
	n	n	n	n
At least 1 sign produced	11	12	13	13
No sign utt.s produced	3	2	1	1

The symbol and sign language samples collected at each assessment period were analyzed on 3 levels - syntactically, semantically, and in terms of the language functions expressed. Changes in these measures over time will be described below. It must be pointed out that whereas the baseline analyses were based only on the children producing sign/symbol output (i.e. the children who did not produce any utterances were excluded from the linguistic analysis), all 19 Bliss Users and 14 BSL (Makaton) Users were included for the purpose of the analysis of linear trends. The Bliss User for whom a language sample was missing at Follow-up I, had to be excluded; but the children who produced no sign output were assigned a score of 0 on the measures concerned. This approach was adopted in order to more accurately reflect progress in augmentative system use.

39.1 Changes in the Syntactic Measures

Table 44.2 presents the children's mean scores at each assessment period for the total number of utterances produced, the mean sign/symbol length of utterance (MSLU), and the percentages of utterances which were spontaneous and response utterances, and single- and multi-term utterances. Because the latter 4 measures comprise percentages out of total utterances produced, they were calculated only for the children who produced sign/symbol output at every assessment period (i.e. 19 Bliss Users and 10 Makaton Signers).

Table 44.2: Means and Standard Deviations for the General Indices of Syntactic Development Over Time

Measure:	Occasion	Bliss Group Mean	Bliss Group S.D.	Bliss (Makaton) Group Mean	Bliss (Makaton) Group S.D.
Total no. of utterances		(n = 19)		(n = 14)	
	1	11.37	7.37	7.29	8.36
	2	15.74	5.26	16.57	13.25
	3	19.53	7.11	23.00	16.01
	4	21.11	9.12	25.43	16.89
% spontaneous utterances		(n = 19)		(n = 10)	
	1	41.32	16.51	45.20	27.57
	2	38.95	22.77	49.60	21.37
	3	36.84	17.27	36.90	20.97
	4	38.37	16.46	40.50	22.85
% responses utterances		(n = 19)		(n = 10)	
	1	58.68	16.51	54.80	27.57
	2	55.79	24.74	50.40	21.37
	3	63.16	17.27	63.10	20.97
	4	61.63	16.46	59.50	22.85
MSLU		(n = 19)		(n = 14)	
	1	1.44	0.44	0.85	0.52
	2	1.50	0.46	0.90	0.39
	3	1.54	0.34	1.06	0.11
	4	1.69	0.43	1.06	0.38
		(n = 19)		(n = 10)	
% single-term utterances	1	69.63	25.17	94.10	18.66
	2	70.32	23.35	94.20	7.55
	3	61.21	19.55	94.30	7.97
	4	54.95	21.95	87.70	17.26
% multi-term utterances	1	30.32	25.16	5.90	18.66
	2	29.68	23.35	5.80	7.55
	3	38.79	19.55	5.70	7.97
	4	45.00	21.98	11.70	17.61

A significant linear trend was identified in each group for the total number of utterances produced (Bliss group: $\underline{t} = 5.25$, $\underline{d.f.} = 18$, $\underline{P} < .001$; Makaton group: $\underline{t} = 4.81$, $\underline{d.f.} = 13$, $\underline{P} < .001$), indicating significant increases over time in the number of symbol and sign utterances produced during the 30-minute recording sessions. At baseline the Bliss Users produced a mean of 11.37 total symbol utterances. The Signers produced fewer total utterances on average (mean = 7.29), although the difference between the 2 groups was not statistically significant ($t = 1.49$, d.f. = 31). By Follow-up III, the Bliss Users produced twice the total number of utterances found at baseline (mean = 21.11), while the Makaton Signers produced over 3 times the number of baseline utterances (mean = 25.43). Thus, at the final assessment, the Signing group produced more utterances on average than the Bliss Users group, although once again the difference was not statistically significant ($t = 0.87$, d.f. = 18.56). However, comparison between the linear trend identified in each group showed that the Makaton group made significantly greater progress on this measure, when compared with the Bliss group ($t = 2.13$, d.f. = 31, $P = .041$). This finding is rather unexpected when one considers the Bliss group's higher cognitive and language comprehension abilities at baseline. On the other hand, the Bliss Users were also significantly more physically handicapped than the Makaton Signers, so that symbol indication was likely to be a slow and laborious process for them, and much more time-consuming than signing. Given the fixed length of the recording sessions, it is understandable that the slower Bliss Users should show a smaller (although still significant) increase in the total number of utterances produced. When this difference between the linear trends identified in the 2 groups was re-examined by an analysis of covariance, controlling for severity of physical handicap, it was no longer significant ($F = 0.79$, $P = .381$).

The difference between the groups in progress on the number of utterances produced can be further explained with reference to the differential changes that were found over time in the lengths of these sign and symbol utterances. The linear trends for the measures of MSLU and percentage of multi-term utterances produced were both significant for the Bliss group ($t = 2.98$, d.f. = 18, $P < .01$; $t = 3.47$, d.f. = 18, $P < .01$), indicating significant and steady increases in utterance length over time. Increases were also found in average utterance length for the BSL (Makaton) group; but neither one of the linear trends on these measures was significant in this group ($t = 1.65$, d.f. = 13; $t = 0.82$, d.f. = 9). By Follow-up III the Bliss Users had a mean MSLU of 1.69, and nearly half of all their symbol utterances were multi-term utterances (i.e. consisting of more than 1 symbol per utterance), whereas the MSLU of the Signing group was 1.06, and on average only 11.7% of their utterances consisted of more than 1 sign in length. The absence of significant improvement in the Signing group in terms of the production of longer and more complex sign utterances over time may be explained by the greater cognitive and language comprehension handicaps evidenced by these children at baseline.

In sum, both groups showed significant increases in the total number of sign/symbol utterances they produced over time in the semi-structured conversational settings. And while the Signing group showed a significantly greater mean increase on this measure when compared with the Bliss group, the latter group <u>also</u> improved significantly in terms of the <u>length</u> of the symbol utterances that were used, whereas the increases shown by the BSL (Makaton) group on the measures of utterance length were not statistically significant.

Despite the teachers' and speech therapists' increasing efforts to foster spontaneous usage of signs and symbols at follow-up, neither group showed a significant increase in the percentage of utterances which were spontaneous, child-initiated utterances, as opposed to responses to prior adult verbalizations. In fact, Table 44.2 reveals slight decreases in the percentage of spontaneous utterances out of total utterances produced, but the linear trends on this measure were not significant (Bliss group: $t = 0.65$, d.f. = 18; Makaton group: $t = 0.93$, d.f. = 9). Comparison between the 2 groups revealed no significant difference between the linear trend identified in each group ($t = 0.51$, d.f. = 27).

The follow-up data on the LARSP summary measures confirm the above findings (see Table 44.3). The Bliss Users group showed a significant decrease over time in the percentage of Stage I entries out of the total LARSP entries ($t = 3.55$, d.f. = 18, $P < .01$), and significant increases in the numbers of Stage II clauses and phrases and Stage IV phrases produced ($t = 4.96$, $P < .001$; $t = 3.99$, $P < .001$; $t = 2.15$, $P < .05$, d.f. = 18 in all cases). The BSL (Makaton) group also showed some improvements on these measures, but the only linear trend which was significant was for the number of Stage II clauses which were used ($t = 3.10$, d.f. = 13, $P < .01$). No significant linear trends were identified in either group on the following measures: the number of Stage III clauses (Bliss group: $t = 0.08$; Makaton group: $t = 1.45$), the number of Stage III phrases (Bliss group: $t = 1.78$; Makaton group: $t = 1.05$), the number of Stage IV clauses (Bliss group: $t = 1.09$; Makaton group: $t = 0.01$), and the number of complex utterances produced (Bliss group: $t = 1.46$; Makaton group: $t = 1.02$). Thus, on the LARSP profiles, too, the Bliss group and, to a lesser extent, the Makaton group showed some improvements in terms of the production of fewer single-term utterances and more 2-term utterances. However, Stage IV clauses and phrases and complex sentence structures were hardly produced at baseline, and neither group showed <u>any</u> improvement on these measures at follow-up. Comparisons between the linear trends identified on the LARSP summary measures revealed no significant differences between the 2 groups on any of the measures (see Table 44.4).

Table 44.3: Means and Standard Deviations for the LARSP Summary Measures Over Time

Measure	Occasion	Bliss Group Mean	Bliss Group S.D.	BSL (Makaton) Group Mean	BSL (Makaton) Group S.D.
% Stage I entries out of		(n = 19)		(n = 10)	
entries at Stages I-V	1	65.84	28.65	92.30	20.20
	2	65.47	27.56	91.80	8.90
	3	56.89	20.93	90.40	10.34
	4	49.26	25.07	83.40	21.86
		(n = 19)		(n = 14)	
No. Stage II clauses	1	2.11	2.47	0.36	1.34
	2	1.79	2.02	0.50	1.09
	3	3.26	1.91	1.07	1.94
	4	4.89	2.94	1.71	2.16
No. Stage II phrases	1	1.53	2.65	0.29	1.07
	2	1.95	1.87	0.64	1.28
	3	2.95	2.72	0.57	1.28
	4	3.90	3.73	1.29	3.75
No. Stage III clauses	1	1.11	2.03	0.00	0.00
	2	1.00	1.86	0.00	0.00
	3	1.11	1.97	0.21	0.58
	4	1.11	1.94	0.21	0.58
No. Stage III phrases	1	1.47	2.67	0.64	1.15
	2	2.00	2.60	0.29	0.83
	3	1.95	3.06	0.79	1.31
	4	2.53	3.36	1.07	2.06
No. Stage IV clauses	1	0.05	0.23	0.00	0.00
	2	0.16	0.50	0.00	0.00
	3	0.16	0.38	0.00	0.00
	4	0.26	0.73	0.00	0.00
No. Stage IV phrases	1	0.05	0.23	0.14	0.54
	2	0.11	0.46	0.07	0.27
	3	0.00	0.00	0.07	0.27
	4	0.58	0.96	0.57	1.60
No. complex utterances	1	0.00	0.00	0.00	0.00
	2	0.11	0.32	0.00	0.00
	3	0.00	0.00	0.07	0.27
	4	0.00	0.00	0.00	0.00

Table 44.4: Comparison Between the Linear Trends Identified in the Bliss and Makaton Groups on the LARSP Summary Measures

	Bliss Group		BSL (Makaton) Group		
	Mean	S.D.	Mean	S.D.	t
% Stage I entries out of I-V	58.32	71.62	28.10	75.49	1.06
No. State II clauses	-9.53	8.38	- 4.64	5.60	1.89
No. Stage II phrases	-8.11	8.86	- 2.93	11.91	1.43
No. Stage III clauses	-0.11	5.98	- 0.86	2.21	0.50
No. Stage III phrases	-3.11	7.59	- 1.79	6.39	0.53
No. Stage IV clauses	-0.63	2.52	0.00	0.00	0.93
No. Stage IV phrases	-1.47	2.99	- 1.29	5.28	0.12
No. complex utterances	0.11	0.32	- 0.07	0.27	1.69

The improvements that were found in terms of the numbers of utterances produced and, for the Bliss group, in terms of utterance length, are encouraging. But it is clear that both groups of augmentative system users made rather slow progress and continued to show severe restriction in the average number, length and complexity of their utterances at follow-up. In contrast to speaking children functioning at 24 months of age and above, who typically produce between 100 and 200 utterances in 30-minute recording periods (eg. Crystal, Fletcher and Garman, 1976), the present subjects produced between 21 and 25 total utterances on average at Follow-up III; and over half of these remained responsive-produced in response to direct questions by the investigator. Moreover, over half of all symbol utterances and 88% of all sign utterances were still only 1 sign/symbol long. Complex utterances were only rarely produced. Progress in MSLU of the sign/symbol utterances was equally limited, with an average increase of just 0.20 to 0.25 signs/symbols per utterance over the 1½ years of the study. Again, this contrasts sharply with the data available for normal, speaking children. Miller and Chapman (1981), for example, established gains of 1.24 morphemes per year (or 0.31 morphemes every 3 months) as the average rate of increase in MLU for a sample of middle- to upper-middle-class, speaking children aged 18 to 60 months. Clearly, severely language handicapped children of below average IQ would not be expected to make similar gains. And it might well be argued that the fact that the present subjects showed even slight improvement on the above measures is encouraging. What is clear, is that despite the claims made for augmentative systems by many practitioners and writers in the field, progress in system use tends to be very slow, and considerable patience and perseverence is required from trainers and parents.

Support for this conclusion comes from a handful of studies which have examined communicative use of signs and symbols by nonverbal and language impaired individuals. As was discussed in Chapter 27, these investigators, too, have found low rates of spontaneous communication among augmentative system users, and a tendency to produce few utterances which are mostly 1 sign or symbol long (Calculator and Dollaghan, 1982; Harris, 1982; Lewis and Ripich, 1984; Light, 1985; Oxman and Blake, 1980). No other study has monitored changes over time in the numbers of sign/symbol utterances produced in recording sessions, or in the percentages of spontaneous and response utterances produced, but the 2 studies which have examined changes in utterance length agree in finding only modest improvements at follow-up. Harris-Vanderheiden, Lippert, Yoder and Vanderheiden (1979) followed up 5 mentally and physically handicapped children who had been in Blissymbol training programmes for between 30 and 41 months, and found that the average length of symbol utterances increased for 3 children from 1.00 to between 2.00 and 3.00 symbols, and for the other 2 children from 1.00 to 4.00 symbols. Bonvillian and Nelson (1976, 1978, 1982) described the progress of a 9-year-old mute autistic boy who was trained in sign use. This boy first spontaneously combined signs after 3 months of training; however, his subsequent combinations did not keep pace in terms of their average length with those reported for speaking children, and most remained 2 or 3 signs in length, even after 6 years of sign training.

It is worthwhile to examine factors in the children, their environments, and in the systems themselves, which may help to explain the limited progress found, in an attempt to identify environmental variables whose manipulation may help to maximize progress. Since many of these factors were discussed in detail in Chapter 27, they will be only briefly reviewed here.

In the first place, opportunities for communication are reduced by the limited social experiences of language impaired, cerebral palsied individuals, by their cognitive impairments, and by the restrictions on their independence and mobility. There may be little to motivate communication when daily activities are routine. Furthermore, since caretaking interaction is so time-consuming, there may be less opportunity for communicative interaction. There are also many unique features as well as constraints within sign and symbol systems which severely reduce the amount of communication that is possible. The slow rate of symbol and even sign transmission does not encourage lengthy and elaborated communication. Aided communication is an effort in time for the listener, and is also effortful for the system user. As a result, essential needs are likely to be communicated, and less salient communication may be left unsaid. The imbalance in the rate of communication between the vocal partner and the augmentative system user (Foulds, 1980) also means that the speaker has the power to control the interaction. As Yoder and Kraat (1983) explain, the slower system user is likely to have difficulty gaining conversational entry, continuing the conversation beyond 1 or 2 utterances, and terminating it when he/she wishes. The slow rate of symbol and sign communication further creates a need for efficiency in utterance production, so that users might deliberately reduce their messages to the least possible number of symbols, leaving out syntactic and stylistic elements that are secondary to the message, because this is faster. In other situations, a gesture, vocalisation or facial expression may be used instead of signs or symbols, to effect speedier communication. This factor, too, may help to account for the present findings of minimal increases in MSLU over time and the comparatively few utterances produced in recording sessions, even at Follow-up III. Also of relevance is the presence of finite and restricted vocabulary sets for communicating content meaning, which are often well below the children's needs and abilities. System users thus have the capability to say much less, since many meanings and forms are unavailable to them.

The limited progress made by the children in sign and symbol production may reflect not only the constraints imposed by the nature of augmentative communication and by the children's cognitive, physical and motivational handicaps, but may also reflect the training procedures used. As was shown in Chapters 24 and 36, the Bliss and Makaton Users received relatively little exposure to formal symbol/sign training at baseline, with a slight decrease in weekly teaching input over time; and the information obtained from teachers also revealed considerable restriction on generality of use of the systems in school settings. By Follow-up III 62% of the children were still using the systems wholly or largely in formal teaching sessions only. Few of the children were therefore in true augmentative communication environments, and most of the adults with whom they interacted continued to communicate with them using speech only. The limited availability of adult models of symbol and sign use may help to explain the children's low rates of spontaneous communication. A basic principle is that children need to receive exposure to, and training in, augmentative communication throughout the day, and not just at designated periods (Bonvillian and Nelson, 1978). This is particularly important in the case of sign and symbol training because the child is being taught to communicate in a way different from the adults' normal language. The implications of the findings from the present study are therefore that the schools will need to make greater and more protracted efforts in teaching augmentative system use if these children's long-standing communication deficits are to be overcome. It is also likely that more sophisticated teaching methods are required than those which are currently employed (Kiernan and Reid, 1984), i.e. techniques which focus on training actual communicative use within the natural environment. For example, Carr and Dores (1981) showed that autistic children who initially used signs only when they were elicited, could readily learn to use them spontaneously when taught to employ signs as requests for actions or objects.

A final point to consider in this section concerns the comparisons between the Bliss and BSL (Makaton) groups in terms of the amount of progress made on the syntactic indices described above. A number of writers have argued that symbol systems have an advantage over sign systems in that, being in a nonfade medium, they provide an external prop for sentence construction, thereby making it easier to compose longer utterances in symbols than in signs (Kiernan, 1983a; MacDonald, 1984). However, comparisons between the linear trends identified in the Bliss and BSL (Makaton) groups showed no significant differences on the measures of mean sign/symbol length of utterance, percentage of multi-term utterances, and percentage of spontaneous utterances produced, nor on any of the LARSP summary measures (see above). And although the Makaton Signers showed a significantly greater increase over time in the total number of utterances produced, this difference was no longer significant when baseline differences between the 2 groups in severity of handicap were controlled for. In other words, on present evidence neither system showed an advantage over the other on these measures. It will be recalled that a similar conclusion was reached in earlier chapters concerning sign and symbol use at baseline, and concerning sign and symbol vocabulary acquisition over time.

Although minimal progress was found in the production of more syntactically complex sign and symbol messages over time, it must be pointed out that this is not <u>necessarily</u> an appropriate criterion of improved communicative effectiveness. In some cases the production of long and complex utterances may severely reduce the rate of communication and result in communication breakdown. Analysis of the semantic relations and pragmatic functions expressed over time is probably much more relevant to successful communication. Progress in these aspects of language development will now be examined.

39.2 Changes in the Semantic Relations Expressed

The analysis of changes in the frequencies with which 2-, 3- and

4-term semantic relations were expressed was complicated by the fact that comparatively few children produced multi-term utterances at all, and different numbers of children produced multi-term utterances at each assessment period. In view of this, the analysis was confined to the 19 Bliss Users and 10 Makaton Signers who produced symbol/sign output at every assessment period, and the frequency of occurrence of each semantic relation was expressed as a percentage of the total number of utterances produced by the children on each occasion. The percentages of utterances (out of total utterances) which fitted each semantic category at baseline and follow-up are presented in Appendix 30.

Examination of the data over time reveals no clear pattern of changes. The 2-term relations of agent-action, agent-object and agent/object-location, and the category of 'other 3-term relations', all of which occurred most frequently at baseline, were also the most frequently expressed categories at Follow-up III; while the relations of negation-X, introducer-X, introducer-modifier-head, action-modifier-head and agent-action-object-location were not used at all at baseline, and were also rarely or never used at Follow-up III. The only categories for which significant linear trends were identified (and only in the case of the Bliss group) were the 2-term semantic relations of modifier-head ($\underline{t}$ = 2.97, $\underline{d.f.}$ = 18, $\underline{P}$ < .01) and agent/object-location ($\underline{t}$ = 3.18, $\underline{d.f.}$ = 18, $\underline{P}$ < .01), and the category of 'other 4-term relations' ($\underline{t}$ = 1.79, $\underline{d.f.}$ = 18, $\underline{P}$ < .05). These were the only categories for which significant increases were found in percentage occurrence over time. The other semantic relations examined showed no clear patterns of change; some increased and others decreased in percentage occurrence from one assessment period to the next, but in none was the linear trend identified significant.

Analysis of the baseline language samples showed that the children expressed similar types of 2-term relational meanings in their early symbol and sign utterances to those expressed by younger normal children with equivalent MLUs (Brown, 1973); although of course the small numbers of multi-term utterances produced resulted in large <u>quantitative</u> differences in the absolute frequencies with which these relations were expressed (see Chapter 27.4). However, the follow-up data presented here show that the children's subsequent combinations over the following 1½ years of the study did not keep pace with those reported for normal children (eg. MacDonald, 1978). As already noted, most utterances remained 1 or 2 signs/symbols long, so that the children did not increase their use of 3- and 4-term semantic relations, nor indeed did they show improved use of the 2-term relations which were infrequently produced at baseline. The only other augmentative communication studies to monitor changes in the semantic relations expressed over time, which were conducted by Bonvillian and Nelson (1978) and Layton and Baker (1981), reached the same conclusion. Their autistic subjects began to combine signs shortly after the commencement of training, and their sign combinations indicated a wide range of semantic relations noted by Brown (1973) for normal children. However, as was found by the present writer, these children too made no notable progress in utterance length or the semantic relations expressed over the following 1½ to 2½ years of sign training.

Comparisons between the linear trends identified on the above measures in the Bliss and BSL (Makaton) groups are presented in Table 44.5. The only difference which was significant was on the 2-term relation of modifier-head. The Bliss Users showed a significantly greater increase in the percentage of occurrence of this relation over time when compared with the Makaton group.

Table 44.5: Comparisons Between the Linear Trends Identified in the Bliss and Makaton Groups for the Percentage of Occurrence of the Semantic Relations Expressed

	Bliss Group (n = 19)		BSL (Makaton) Group (n = 10)		
	Mean	S.D.	Mean	S.D.	t
Agent-action	- 4.32	26.82	-1.80	17.15	0.27
Action-object	- 4.26	10.69	-0.90	2.51	1.30
Agent-object	- 3.68	21.11	-0.40	6.90	0.62
Modifier-head	-10.42	15.29	-1.00	2.16	2.64*
Negation-X	- 1.68	6.24	0.00	0.00	0.85
Action-location	- 0.47	13.01	-1.00	3.16	0.17
Agent/object-location	-21.26	29.13	-8.10	15.04	1.60
Introducer-X	- 0.68	4.66	0.00	0.00	0.46
Agent-action-object	- 4.05	13.07	-0.80	1.93	1.06
Experiencer-state-source	5.74	18.60	0.00	0.00	0.97
Introducer-modifier-head	0.00	0.00	0.00	0.00	0.00
Agent-action-location	3.11	11.22	-0.80	2.53	1.45
Action-modifier-head	0.00	0.00	0.00	0.00	0.00
Other 3-term relations	3.47	37.82	0.90	6.19	0.29
Agent-action-obj.-location	- 0.79	3.44	0.00	0.00	0.72
Other 4-term relations	- 5.53	13.49	-1.00	11.51	0.90

In sum, both groups of children showed minimal improvement in the percentage of occurrence of 2- , 3- and 4-term semantic relations in their sign and symbol language samples. These results accord with the earlier findings of the children's limited progress on the measures of utterance length and complexity over the 1½ years of the study. Among the factors already discussed in earlier chapters, which may help to explain these results, are the children's limited social and communicative experiences, their cognitive, physical and linguistic impairments, the absence of everyday models of sign and symbol use, and the vocabulary limitations of their sign and symbol repertoires, which inevitably impose restrictions on the range of meanings which may be expressed in communicative interactions.

39.3 Communicative Functions Expressed at Follow-up

At each assessment period the sign and symbol utterances produced were classified according to their communicative functions, using Dore's (1977, 1979) 6 categories of conversational act types (see Appendix 10 for definitions). Means and standard deviations for the percentages of utterances expressing each act type over time are presented in Table 45.1, and are based on the 19 Bliss Users and 10 Makaton Signers who produced sign/symbol output at every assessment period.

As can be seen in the table, there was a tendency for the percentage of utterances expressing Requests to decrease over time; the linear trend identified on this measure was significant for the Bliss Users group ($t = 2.51$, d.f. = 18, $P < .05$), but not for the BSL (Makaton) group ($t = 1.37$, d.f. = 9). There was a slight tendency for the percentage of occurrence of the Statements and Descriptions categories to increase from baseline to Follow-up III, but the pattern was not one of steady increase, and the linear trends identified on these measures were not significant in either the Bliss or BSL (Makaton) groups (Statements: Bliss group - $t = 1.07$; Makaton group - $t = 0.86$. Descriptions: Bliss group - $t = 1.20$; Makaton group - $t = 0.01$; d.f. = 18,9). There were also no significant linear trends for the categories of Responses (Bliss group: $t = 0.80$; Makaton group: $t = 1.11$), Organization Devices (Bliss group: $t = 0.66$; Makaton group: $t = 1.41$), Performatives (Bliss group: $t = 1.00$; Makaton group: $t = 0.00$) and Other Functions (Bliss group: $t = 0.00$; Makaton group: $t = 0.00$; d.f. = 18,9 in all cases).

Thus, very few changes were evident in the relative frequencies with which the various communicative functions were expressed over time. Apart from the decrease in the percentage of Requests, the relative frequencies of the communicative functions remained very similar at Follow-up III to those identified 1½ years earlier. Responses remained the most frequently

Table 45.1: Communicative Functions Expressed - Means and Standard Deviations for the Percentages of Total Utterances in Each Category Over Time

		Bliss Group (n = 19)		BSL (Makaton) Group (n = 10)	
Communicative Function	Occasion	Mean	S.D.	Mean	S.D.
Requests	1	13.26	15.87	12.70	31.18
	2	6.26	11.12	3.80	8.50
	3	2.68	5.49	0.70	1.64
	4	4.79	8.44	0.40	1.27
Responses	1	57.58	16.33	53.60	28.06
	2	54.58	30.37	50.50	21.30
	3	62.47	17.93	63.10	20.97
	4	59.89	16.16	59.30	23.10
Statements	1	2.90	4.83	0.50	1.58
	2	7.95	9.66	1.40	3.27
	3	5.63	6.99	3.00	3.71
	4	5.32	8.18	1.40	3.50
Descriptions	1	23.26	17.01	31.20	21.01
	2	22.26	20.36	43.00	20.58
	3	28.74	15.17	30.40	20.78
	4	26.68	15.57	35.50	20.66
Organization devices	1	0.32	1.38	0.00	0.00
	2	0.26	1.15	1.50	3.38
	3	0.00	0.00	0.00	0.00
	4	0.16	0.69	0.00	0.00
Performatives	1	0.00	0.00	0.00	0.00
	2	0.26	1.15	0.00	0.00
	3	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00
Other functions	1	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00

expressed function, constituting just over half of all sign and symbol utterances at baseline and at final follow-up. Descriptions (mainly expressing a simple labelling function) were the next most frequently used function at each assessment period, while Statements continued to be employed relatively infrequently. The almost complete absence of

Performatives and Organizational Devices also persisted from baseline to Follow-up III. At the final assessment period, then, 87% of all symbol utterances and 95% of all sign utterances could be accounted for in terms of just 2 conversational act types - Responses and Descriptions.

To sum up, as was the case for the syntactic and semantic measures, analysis of the pragmatic functions used over time showed no improvements in terms of the range of functions expressed, nor in terms of hoped for increases in the relative frequency of spontaneous communications (statements, requests, descriptions) as opposed to responses to prior adult verbalizations. The Bliss and Makaton Users remained markedly restricted in the range and frequency of communicative functions employed, when compared with Dore's (1977) 3-year-old normal speakers. These children were found to express relatively fewer Responses, and more spontaneous Requests, Statements, Organization Devices and Performatives in their speech, when compared with the baseline and follow-up data for the present subjects (see Table 23). As already discussed, the sign and symbol users' persisting deficits in terms of functional use of signs and symbols are likely to be due to a variety of factors, including the passivity and lack of initiation that characterize many language impaired and physically handicapped individuals, their limited cognitive and linguistic experiences, the limitations of the augmentative communication systems themselves in terms of slow transmission rates and small vocabulary sets, the types of communicative acts addressed to them by vocal partners, and the amount and type of training given (see Chapter 27.5). Certainly, the augmentative communication training which the present subjects received over an average of 2½ years did not appear to have much success in fostering increased spontaneous and varied usage of the systems.

A final point to note here is that comparisons between the Bliss and BSL (Makaton) groups revealed no significant differences between the linear trends identified in each group (see Table 45.2).

39.4 Summary of the Syntactic, Semantic and Pragmatic Analyses of the Symbol and Sign Language Samples Produced Over Time

Findings on the children's developing use of signs and symbols in recording sessions were rather disappointing. Significant increases were found over time in the total number of symbol and sign utterances produced, and, for the Bliss group, in the mean length of these utterances. However progress on these measures was very slow. Moreover, few significant changes were noted in the range and relative frequencies of the semantic relations

Table 45.2: Comparisons Between the Linear Trends Identified in the Bliss and BSL (Makaton) Groups for the Percentages of Utterances Expressing the Communicative Function Types

	Bliss Group (n = 19)		BSL (Makaton) Group (n = 10)		
	Mean	S.D.	Mean	S.D.	t
Requests	29.00	50.27	40.00	92.17	0.35
Responses	-14.84	81.06	-29.70	84.80	0.46
Statements	- 4.95	20.21	- 4.30	15.73	0.09
Descriptions	-16.74	60.62	- 0.30	74.82	0.64
Organization devices	0.74	4.83	1.50	3.38	0.44
Performatives	0.26	1.15	0.00	0.00	0.72
Other functions	0.00	0.00	0.00	0.00	0.00

and communicative functions expressed by the children. Thus, by Follow-up III, both groups continued to show severe restriction in the number, length and complexity of their sign and symbol utterances, and notable gaps in the range of communicative functions expressed, even when compared with younger, normal speakers. It cannot be denied that the augmentative systems allowed many of these severely handicapped children to communicate meanings and functions which were unavailable to them in speech. However, it is also clear that if these systems are to become more fully functional for the children and if they are to make greater progress in their use, their teachers will need to make far greater investment in augmentative system training, by introducing more sophisticated teaching methods and by providing wider support for system use in the children's natural environments.

Comparisons between the amounts of progress made by the sign and symbol users in conversational use of the systems revealed very few differences between the 2 groups, and the few differences which were significant disappeared when baseline differences in IQ, language comprehension and severity of physical handicap were taken into account. These findings suggest that neither system had an advantage over the other in terms of progress in system use, at least on the kinds of measures employed in this study. Of course this does not mean that both systems would be equally successful for any one individual child.

39.5 Changes in the Acquisition and Use of Signs/Symbols in Children of Low and High Ability Levels

It has been pointed out by a number of writers (eg. Howlin, 1979) that simply analyzing changes across groups may well disguise varying patterns of change in different subgroups of children. Language impaired cerebral palsied children do not constitute a homogeneous population, and it is therefore important to examine differences in the rates of change not only between the Bliss and Makaton groups as a whole, but also between various subgroups of children within these 2 groups. One variable that may be especially relevant is cognitive level.

At baseline cognitive level as measured on the Columbia MMS was found to be related to the acquisition and use of both symbols and signs. But when the children in each group were subdivided into a 'low-IQ' group (IQ of 55 or below) and a 'higher-IQ' group (IQ above 55) and their performance compared on the baseline measures of sign/symbol acquisition and use, it was found that although the 'low-IQ' groups achieved poorer mean scores on almost every measure, relatively few of the differences reached statistical significance (see Chapter 29). More importantly, all the 'lower-IQ' children acquired at least some symbols/signs at baseline, and most were able to use these in the semi-structured conversational settings. These findings showed that low-ability children could learn to acquire and use at least some signs/symbols in the early stages of training, and they therefore argue against the practice prevalent in many schools of excluding low cognitive ability children from Blissymbol programmes because of the belief that such children are unable to cope with the complexities of the system. The role of IQ as a predictor of response to sign/symbol training will be examined in a later chapter, together with other possible predictors. However, at this point a similar approach will be adopted to that used at baseline, in order to compare changes over time on the measures of sign/symbol acquisition and use in the 'low-' and 'higher-IQ' Bliss and Makaton groups.

In the Bliss group, the 'low-IQ' subgroup (Columbia IQs of 55 or below) consisted of 4 children, and the 'higher-IQ' group consisted of 15 children; in the BSL (Makaton) group there was a more even split, with 8 'low-IQ' children and 6 'higher-IQ' children. Table 46.1 presents the mean scores and standard deviations for the linear trends identified in these groups on the measures of symbol/sign acquisition and syntactic and pragmatic use over time. The semantic relation variables were not included here because of the relatively small numbers of multi-term utterances which were produced. Table 43.2 presents the results of 2-way analyses of variance on the linear trends for these measures, providing statistical tests for differences due to the main effects of Bliss/Makaton Group and IQ, and their interaction Group X IQ.

Examination of the mean linear trends presented in Table 46.1 does not reveal any consistent pattern of differences between the groups. On the

Table 46.1: Linear Trends in the 'Low-' and 'Higher-IQ' Bliss and Makaton Users on the Measures of Symbol/Sign Acquisition and Use

	Bliss Group		BSL (Makaton) Group	
	Low-IQ (n = 4)	Higher-IQ (n = 15)	Low-IQ (n = 8)	Higher-IQ (n = 6)
Symbols/signs taught	-192.25 ± 36.64	-235.19 ± 220.92	- 93.63 ± 77.21	-131.67 ± 145.37
% symbols/signs understood	- 5.00 ± 49.72	- 29.13 ± 84.54	- 24.63 ± 136.11	- 65.83 ± 62.32
% symbols/signs produced	- 77.75 ± 37.34	- 89.40 ± 55.09	-145.63 ± 62.86	-106.00 ± 51.95
Total utterances	- 42.00 ± 24.13	- 30.60 ± 28.45	- 67.25 ± 50.08	- 52.33 ± 46.48
MSLU	- 0.92 ± 0.76	- 0.73 ± 1.22	- 1.10 ± 2.13	- 0.40 ± 1.36
% 1-term utterances	68.00 ± 67.95	49.20 ± 68.41	2.50 ± 11.45	30.17 ± 86.38
% multi-term utt.s	- 68.00 ± 67.95	- 49.20 ± 68.41	- 2.50 ± 11.45	- 27.17 ± 87.20
% Stage I entries out of LARSP Stages I-V	72.50 ± 73.28	54.53 ± 73.27	8.00 ± 19.31	45.50 ± 97.44
Stage II clauses	- 13.50 ± 7.42	- 8.47 ± 8.53	- 2.25 ± 3.88	- 7.83 ± 6.24
Stage II phrases	- 5.25 ± 5.38	- 8.87 ± 9.58	- 0.38 ± 1.19	- 6.33 ± 18.51
Stage III clauses	0.25 ± 0.50	- 0.20 ± 6.77	0.00 ± 0.00	- 2.00 ± 3.16
Stage III phrases	- 1.25 ± 1.71	- 3.60 ± 8.50	- 0.88 ± 1.46	- 3.00 ± 10.00
Stage IV clauses	- 0.75 ± 1.50	- 0.60 ± 2.77	0.00 ± 0.00	0.00 ± 0.00
Stage IV phrases	- 0.75 ± 1.50	- 1.67 ± 3.29	- 0.38 ± 1.06	- 2.50 ± 8.24
Complex utterances	0.00 ± 0.00	0.13 ± 0.35	0.00 ± 0.00	- 0.17 ± 0.41
% Requests	44.00 ± 54.69	25.00 ± 50.27	87.50 ± 141.27	8.33 ± 17.56
% Responses	- 55.00 ± 84.50	- 4.00 ± 79.50	- 22.00 ± 129.83	- 34.83 ± 52.44
% Descriptions	- 10.50 ± 59.48	- 18.40 ± 62.87	- 43.25 ± 80.55	28.33 ± 61.02
% Statements	- 5.25 ± 30.10	- 4.87 ± 18.19	- 14.25 ± 20.17	2.33 ± 8.31
% Organization devices	0.00 ± 0.00	0.93 ± 5.46	1.25 ± 2.50	1.67 ± 4.08
% Performatives	0.00 ± 0.00	0.33 ± 1.29	0.00 ± 0.00	0.00 ± 0.00

measures of sign/symbol acquisition, the 2 'higher-IQ' groups made slightly more progress on average than the 'low-IQ' groups; while on the measures of total utterances produced and MSLU, the 'low-IQ' groups made more progress on average. On the LARSP summary measures and the communicative function categories, the comparisons revealed even less consistency in the changes that were found in the 'low-' and 'higher-IQ' groups. As can be seen in Table 46.2, the main effect of IQ (adjusted for the Bliss/Makaton Group effect) was not significant for any of the measures, nor were there any significant Bliss/Makaton Group effects (adjusted for IQ) or

Table 46.2: Changes in the Acquisition and Use of Signs/Symbols Over Time - F-ratios for Bliss/Makaton Group and IQ Effects

	Bliss/Makaton Group adj. for IQ	IQ adj.for Bliss/Mak.Group	Interaction
Symbols/signs taught	3.03	0.53	0.02
% symbols/signs understood	0.71	0.81	0.05
% symbols/signs produced	3.02	0.49	1.43
Total utterances	2.59	0.81	0.01
MSLU	0.06	0.64	0.19
% 1-term utterances	1.54	0.00	0.63
% multi-term utterances	1.72	0.00	0.55
% Stage I entries out of LARSP Stages I-V	0.97	0.02	0.65
Stage II clauses	3.01	0.03	3.62
Stage II phrases	0.77	1.44	0.08
Stage III clauses	0.42	0.44	0.17
Stage III phrases	0.04	0.62	0.00
Stage IV clauses	0.76	0.01	0.01
Stage IV phrases	0.06	0.90	0.14
Complex utterances	2.69	0.04	1.67
% Requests	0.01	2.66	1.17
% Responses	0.10	0.45	0.81
% Descriptions	0.70	0.93	2.07
% Statements	0.07	0.85	1.00
% Organization devices	0.24	0.14	0.02
% Performatives	0.35	0.21	0.16

Group X IQ interaction effects. The absence of significant effects on the analyses of variance is not surprising in view of the small numbers of subjects in each subgroup, and in view of the relatively few changes found in sign/symbol use in the Bliss and Makaton groups overall. But the present findings do show that whatever progress was made by the subjects over time was not confined exclusively to the children who were more cognitively able. Thus, the results of the analysis of variance procedures confirm the conclusion drawn earlier, on the basis of the baseline analyses, that there is no justification for excluding severely and profoundly mentally handicapped children from augmentative communication training programmes simply on the basis of IQ. It is clear that in the present study these children did benefit from the programmes to the extent that they were able to acquire and use at least some Blissymbols and Makaton Vocabulary signs, and to the extent that the progress they made on these measures over time was not significantly different from the progress made by the more cognitively able Bliss and BSL (Makaton) Users.

The relationship between IQ, and other child characteristics, and response to the sign and symbol training programmes will be examined further in a later chapter.

Chapter 40. Changes in Teachers' and Parents' Descriptions of the Children's Communicative Abilities and Use of Signs and Symbols Over Time

At each assessment period the children's speech therapists/teachers and parents were asked to complete structured questionnaires, which included questions concerning the children's motivation to communicate, the frequency with which they used Blissymbolics and BSL (Makaton) Signing, and the frequency with which they communicated with a range of people, including parents, teachers, other adults, peers and strangers. These questionnaire items are described in detail in Chapter 19.3.4, and they are listed in Appendices 11 and 12.. Appendix 31 presents the means and standard deviations of the children's total 'motivation to communicate' scores at each assessment period; and the percentage distributions of the extent to which the children used signs and symbols for a variety of purposes and communicated with a range of people.

Examination of the tables presented in Appendix 31 shows improved ratings over time on all of the above measures, and the linear trends identified were significant for most of these, as follows: 1. Motivation to communicate (Bliss group: $t = 6.71$, $P < .001$; Makaton group: $t = 6.69$, $P < .001$). 2. Use of symbols/signs to answer questions (Bliss group: $t = 2.23$, $P < .05$; Makaton group: $t = 2.70$, $P < .02$). 3. Use of symbols to ask for objects (Bliss group: $t = 2.25$, $P < .05$). 4. Use of symbols to indicate needs (Bliss group: $t = 3.28$, $P < .01$). 5. Use of symbols to engage in conversations (Bliss group: $t = 8.45$, $P < .001$). 6. Communication with teachers (Bliss group: $t = 2.09$, $P < .05$; Makaton group: $t = 4.79$, $P < .001$). 7. Communication with peers (Bliss group: $t = 4.97$, $P < .001$; Makaton group: $t = 3.37$, $P < .01$), and 8. Communication with strangers (Bliss group: $t = 3.32$, $P < .01$; Makaton group: $t = 5.93$, $P < .001$; d.f. = 19, 13 in all cases). In the Bliss group, the linear trends were not significant for the measures of communication with the class teacher and with parents ($t = 1.98$, d.f. = 19; $t = 1.68$, d.f. = 19); and in the BSL (Makaton) group the trends were not significant for use of signs to ask for objects ($t = 0.79$), to indicate needs ($t = 1.36$), and to engage in conversations ($t = 1.99$), and for communication with parents and teachers ($t = 1.89$; $t = 0.00$; d.f. = 13). However, some improvements were noted even on these measures, and on the measures of communication with class teachers and parents the majority of children were given high ratings from the start. Thus, by Follow-up III over half of the children were rated as 'usually communicating' with parents, class teachers, and also with other teachers, peers and strangers. And although between 5% and 35% of the children were still rated as never using augmentative systems in conversations or to express needs and desires, at least one-third were now said to be using the systems reliably for these purposes.

As can be seen in Table 47.1, there were no significant differences

Table 47.1 Comparisons Between the Linear Trends Identified in the Bliss and BSL (Makaton) Groups on Teacher and Parent Ratings of the Children's Communicative Abilities

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)		
	Mean	S.D.	Mean	S.D.	t
Motivation to communicate	-17.40	11.61	-20.57	11.51	0.79
Use of symbols/signs to answer quest.s	- 0.95	1.91	- 2.00	2.77	1.31
Use of symbols/signs to ask for obj.s	- 1.35	2.68	- 0.50	2.38	0.95
Use of symbols/signs to indicate needs	- 1.35	1.84	- 1.00	2.75	0.45
Use of symbols/signs in conv.	- 3.00	1.59	- 1.50	2.82	1.80
Comm. with class teacher	- 0.60	1.35	- 0.64	1.28	0.09
Comm. with other teachers	- 1.20	2.59	- 2.50	1.95	1.59
Communication with peers	- 1.85	1.66	- 2.14	2.38	0.42
Communication with strangers	- 1.95	2.63	- 3.07	1.94	1.36
Communication with parents	- 0.35	0.93	0.00	0.00	1.40

between the linear trends identified on the above measures in the Bliss and BSL (Makaton) groups.

It can be concluded that, in contrast to the findings described in Chapter 39, which showed modest improvements on formal assessment of sign/symbol acquisition and use, the present results indicate encouraging qualitative gains in the children's communicative abilities and interactions over time as judged by parents and teachers. Of course it is possible that their responses to the questionnaire items may reflect an overall impression of improvement rather than specific changes in the children.

Some increase was also found from baseline to Follow-up III in the extent to which the augmentative systems were used in the home. This measure constitutes a subjective assessment made by the investigator at each assessment period, on the basis of parents' responses to the questionnaire. At baseline no Bliss Users and only 1 Makaton Signer received frequent exposure to augmentative communication in the home environment, while the 2 systems were not used at all or seldom used in the homes of 75% of the Bliss Users and 29% of the Makaton Signers. By Follow-up III 20% of the children received frequent exposure to sign/symbol use at home. The linear trend identified on this measure was significant for the Bliss group (t = 3.68, d.f. = 19, P < .001), but not for the BSL (Makaton) group (t = 1.68, d.f. = 13). However, it must be pointed out that even by Follow-up III, and 2½ years on average after they had first been introduced to augmentative communication training at school, symbols/signs were seldom or never used in the homes of 40% of the Bliss Users and 14.3% of the Makaton Signers, and were only 'occasionally' used in the homes of a further 40% of Bliss Users and 64% of Makaton Users (see Table 47.2). These figures, and the data on extent of exposure to the systems at school (see Table 41.3) clearly show that by the end of the study only a small minority of the children could be described as being in total symbol or signing environments. This may well be one

Table 47.2: Changes Over Time in the Extent of Symbol/Sign Use in the Home

	Bliss Group (n = 20)				BSL (Makaton) Group (n =14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	35	20	20	15	21.4	14.3	0.0	14.3
Seldom	30	30	30	25	7.1	21.4	21.4	0.0
Occasionally	35	45	30	40	64.3	35.7	50.00	64.3
Frequently	0	5	20	20	7.1	28.6	28.6	21.4

explanation for the small amounts of progress that were found in this investigation in the children's use of signs and symbols in the semi-structured conversational sessions.

Examination of parents' ratings of their attitude to the use of Bliss and Makaton with their children also showed some improvement over time (see Table 47.3). However, the linear trends identified on this measure were not significant for either the Bliss group (t = 1.17, d.f. = 19) or the BSL (Makaton) group (t = 0.32, d.f. = 13), and by Follow-up III there were still only 23 sets of parents (68%) who gave full approval to the use of signs and symbols. There were no significant differences between the linear trends identified in the Bliss and Makaton groups on the measures of home use of the system (t = 0.70, d.f. = 32) or parental attitudes (t = 0.62, d.f. = 32), thereby confirming the conclusion reached at baseline that parents do not appear to take to one system more readily than to another.

Table 47.3: Changes in Parents' Attitudes to the Use of Augmentative Systems of Communication

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Totally opposed	0	0	0	0	0.0	0.0	7.1	7.1
Not in favour	20	0	0	5	0.0	0.0	0.0	0.0
Indifferent or uncertain	10	10	5	10	14.3	0.0	0.0	0.0
Some support	20	40	40	30	21.4	28.6	14.3	7.1
Fully in favour	50	50	55	55	64.3	71.4	78.6	85.7

These data show that, by Follow-up III, significant proportions of parents were still reluctant to fully approve the systems and to make serious efforts to use them at home. It would thus appear that parental acceptance and use of augmentative communication does not inevitably follow when their children are placed in training programmes, and that the training and counselling of parents is likely to constitute a long term process. Given the commonly accepted view that the attitudes and involvement of the people in the child's environment are likely to be crucial for the success of a communication programme, it seems clear that speech therapists and teachers need to make more consistent and protracted efforts not only to incorporate augmentative communication into the school setting, but also to involve parents in training and to encourage them to use the systems with their children at home.

Chapter 41. The Development of Speech

41.1 Changes in Spoken Language Over Time

An objection often raised by parents and teachers to the prospect of teaching sign and symbol systems to language impaired children, is that the acquisition of an augmentative mode of communication will inhibit the eventual acquisition of spoken language. This concern was mentioned at baseline by 45% of parents of Bliss Users and by 30% of parents of Makaton Signers, and it was one of the main reasons for their reluctance to give full approval to the use of these systems with their children. However, as will be shown below, analysis of the changes in the children's spoken language abilities over time provides no justification for such fears. Moreover, it will be recalled that of the 6 children with whom the teaching of augmentative communication was abandoned after the baseline assessment, 3 were said to have shown marked improvement in their use of speech and to have discarded signing themselves, using signs only occasionally to clarify the meanings of spoken words. While it cannot be claimed that their enhanced verbal skills were the result of the sign training programmes, it is clear that this training did not inhibit their development of speech.

Tables 48.1, 48.2 and 48.3 show the distributions for the numbers of intelligible words the children had, their Reynell Expressive Language Ages, and the numbers of children producing spoken utterances in the recording sessions, at each of the 4 assessment periods. Raw score means and standard deviations on the Reynell Expression Scale, the Verbal Imitation Test, and the recording measures of total utterances produced and MLU, are presented in Table 48.4. It must be pointed out that whereas the baseline analyses of the expressive language samples were based only on the children producing speech output (i.e. children who did not produce any spoken utterances were excluded), all 20 Bliss Users and 14 Makaton Signers were

Table 48.1: Number of Intelligible Words

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
No. of words	%	%	%	%	%	%	%	%
3 or less	80	75	60	55	42.9	35.7	28.6	28.6
4 - 10	10	15	30	25	35.7	35.7	21.4	21.4
11 - 30	5	5	0	10	14.3	14.3	35.7	35.7
More than 30	5	5	10	10	7.1	14.3	14.3	14.3

Table 48.2: Reynell Expressive Language Ages

	Bliss Group (n =20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
Language Age	1	2	3	4	1	2	3	4
(in months)	%	%	%	%	%	%	%	%
12 or below	75	65	65	60	42.9	28.6	28.6	28.6
13 - 23	15	30	25	30	50.0	50.0	50.0	42.9
24 - 35	10	5	10	10	7.1	21.4	21.4	21.4
36 - 47	0	0	0	0	0.0	0.0	0.0	7.1
48 or above	0	0	0	0	0.0	0.0	0.0	0.0

Table 48.3: Numbers of Children Producing Spoken Language Samples in Recording Sessions

i) Bliss Group (n = 20)

	Baseline	Follow-up I	Follow-up II	Follow-up III
	%	%	%	%
At least 1 word produced	30	30	30	35
No utterances produced	70	70	70	65

ii) BSL (Makaton) Group (n = 14)

	Baseline	Follow-up I	Follow-up II	Follow-up III
	%	%	%	%
At least 1 word produced	64.3	85.7	78.6	78.6
No utterances produced	35.7	14.3	21.4	21.4

included in the present analyses. Children who produced no spoken utterances at a given assessment period were assigned a score of 0 on the measures of total utterances produced and MLU.

Significant linear trends were evident for both groups on the number of intelligible words the children used (Bliss group: $t = 3.08$, $d.f. = 19$, $P < .01$; Makaton group: $t = 2.87$, $d.f. = 13$, $P < .02$), and, for the Makaton group, on the Reynell Expressive Scale ($t = 4.10$, $P = < .01$) and Verbal Imitation Test ($t = 4.61$, $P < .001$). The Linear trends for the Bliss group on these latter 2 measures were just short of statistical significance ($t = 2.05$; $t = 1.82$). These results indicate continued improvement on all 3 measures of expressive speech over the 4 assessment occasions for subjects in both groups. However, as can be seen in Tables 48.1 and 48.2, even by Follow-up III the children's spoken language ability remained extremely limited. Half of the Bliss Users and 28.6% of the Makaton Signers still had no more than 3 intelligible spoken words, and only 2

Table 48.4: Means and Standard Deviations of Scores on the Verbal Language Tests and Spoken Language Samples

Measure	Occasion	Bliss Group (n = 20) Mean	S.D.	BSL (Makaton) Group (n = 14) Mean	S.D.
Reynell Expressive Scale	1	7.95	6.43	10.29	6.13
	2	7.95	7.17	14.14	9.38
	3	9.25	9.28	15.50	9.90
	4	9.70	9.35	17.57	11.69
Verbal Imitation Test	1	1.90	3.75	3.79	4.14
	2	1.95	3.59	6.29	4.58
	3	2.05	3.05	7.07	4.39
	4	2.75	3.57	8.07	5.24
Total utterances produced	1	1.20	2.24	4.14	5.04
	2	2.50	4.58	10.29	15.28
	3	4.55	7.98	17.14	18.98
	4	4.15	7.60	20.14	24.04
MLU	1	0.34	0.54	0.64	0.50
	2	0.29	0.53	0.93	0.43
	3	0.35	0.57	0.98	0.67
	4	0.47	0.75	1.01	0.72

children in each group were able to use more than 30 words to communicate. Similarly, at every assessment period the median language age on the Reynell Expressive Scale remained at 12 months or below for the Bliss group and between 13 and 23 months for the BSL (Makaton) Users. The highest language age obtained at Follow-up III was between 3.00 and 4.00 years, and this was achieved by only 1 Makaton Signer.

Table 48.3 shows only slight increases in the numbers of children who produced spoken language samples over time, with 30% of Bliss Users and 64.3% of Makaton Signers producing speech at baseline, and 35% of Bliss Users and 78.6% of Signers producing at least 1 spoken utterance at Follow-up III. However, there were notable increases in the total number of spoken utterances produced over time (see Table 48.4), and the linear trend identified on this measure was significant for both groups of children (Bliss group: $t = 2.16$, d.f. = 19, $P < .05$; Makaton group: $t = 3.23$, d.f. = 13, $P < .01$). Some improvement was also found on the measure of mean length of utterance, but the linear trend identified fell short of significance in both groups (Bliss group: $t = 1.58$, d.f. = 19; Makaton group: $t = 2.04$, d.f. = 13). Although the absence of significant increases in MLU is disappointing, it is not unexpected given the significant increases in the total number of utterances produced, and given the fact that even normal speakers do not show steady increase in MLU, and instead growth curves on this measure tend to move erratically over relatively short periods of time.

Comparisons between the Bliss and BSL (Makaton) groups showed no significant differences in the linear trends identified on the measures of the number of intelligible words the children had and MLU of the spoken utterances produced. However, as can be seen in Table 48.5, there were significant differences between the linear trends in the 2 groups on the Reynell Expressive Scale, the Verbal Imitation Test and the total number of spoken utterances produced, with the Makaton Signers showing greater increases on these measures over time than the Bliss Users. The comparatively greater improvement made by the Signing children is likely to be due to the fact that this group was significantly less physically handicapped in general, and, in particular, was rated by speech therapists at baseline as having significantly less impairment of the oral musculature, when compared. with the Bliss Users group (see Chapter 25.2). It would appear that because the neuromuscular status of the oral musculature among the Bliss Users was more severely impaired, these children were unable to make as much progress in the development of vocal skills. In fact, when baseline differences between the 2 groups in severity of physical handicap were controlled for, using analysis of covariance procedures, the differences between the linear trends were no longer significant ($F = 2.23$, $P = .146$; $F = 1.87$, $P = .182$; $F = 3.73$, $P = .063$).

Table 48.5: Comparisons Between the Linear Trends Identified in the Bliss and Makaton Groups for the Measures of Spoken Language

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)		
	Mean	S.D.	Mean	S.D.	t
No. of intelligible words	- 1.40	2.04	- 1.79	2.33	0.51
Reynell Expressive Scale	- 6.55	14.29	-23.21	21.19	2.74*
Verbal Imitation Test	- 2.65	6.52	-13.64	11.08	3.33*
Total utterances produced	-10.90	22.59	-54.86	63.64	2.48*
MLU	- 0.47	1.33	- 1.16	2.13	1.16

The progress found on the measures of expressive speech is certainly encouraging, particularly since the high numbers of significant results, which are consistently in the direction predicted, indicate that the changes are meaningful and unlikely to be attributable to chance factors. Support for these findings comes from a host of other sign and symbol training studies, which have also claimed improvement in the spoken language ability of at least some of their subjects following simultaneous communication training (eg. Carrier, 1976; Duncan and Silverman, 1977; Layton and Baker, 1981; McDade, Simpson and Booth, 1980; Miller and Miller, 1973; Schaeffer, 1980a), although few of these studies present baseline and post-training measures in support of this conclusion, or include control conditions. A few clinicians have cautioned that they sometimes find an initial reduction in speech output when signs/symbols are first introduced, which is then followed by increases in speech (eg. Parnes, in Shane, 1984). However, this impression was not confirmed by the present results, which showed fairly steady increases in scores on the spoken language measures from baseline. Writers have attributed this improvement in oral skills to a variety of factors, including increased motivation on the part of the child as a result of successful augmentative communication experiences, decreases in pressure on the child that result once he/she finds that accurate interpretation of messages does not depend on the intelligibility of vocalizations, and the redundancy present in the simultaneous communication programme, in that both speech and signs/symbols convey the same information (Goodman and Kroc, 1981; Kiernan, Reid and Jones, 1982). However, given the absence of control groups in the studies, it cannot be assumed that these improvements are the result of enhanced expressive and receptive skills which subjects may have gained through their exposure to sign or symbol training programmes. Improvement in language expression is likely to occur with age, even in severely language handicapped children, and the changes found here could well be due to the passage of time and the children's own maturation, rather than to the training programmes. Thus, on the basis of the present findings, it can be concluded only that there is no evidence that learning to use augmentative systems of communication hinders or prevents the development of speech. It is also apparent that the changes reported do not depend on the type of augmentative system used, since roughly parallel effects were found in the Blissymbol and BSL (Makaton) groups once baseline differences between the 2 groups were taken into account.

In an attempt to clarify the relationship between progress in speech and progress in the use of signs/symbols, correlations were run between the linear trends identified on the measures of the Reynell Expressive Scale, the total spoken utterances produced and the MLU of the spoken utterances on the one hand, and the linear trends on the measures of sign/symbol acquisition, extent of home and school use of the systems, total sign/symbol utterances produced and MSLU, on the other hand. The resulting

Kendall correlation coefficients are presented in Appendix 32. In both the Bliss and Makaton groups there were no significant correlations between progress on the spoken language measures and progress in the numbers of signs/symbols acquired and extent of use of the systems at home and in school. While these results suggest an absence of relationships between these measures, it must also be borne in mind that the amount of improvement found, particularly on the latter measures, was relatively small. On the other hand, there were significant positive correlations in the Bliss group between progress in the total number of symbol utterances produced and progress on the Reynell Expressive Scale and total number of spoken utterances produced. Clearly, these results cannot be used to argue for a cause-effect relationship, but they do show that improvements in the quantity of symbol use were accompanied by improvements in spoken language. In the BSL (Makaton) group the picture was altogether different, with significant negative correlations between improvement in the length of the signed utterances produced, and improvement on the Reynell Scale and spoken utterances produced. Given that the Signers had more speech to start with, when compared with the Bliss group, it would appear that as their spoken language became more effective, they became less reliant on the use of signing for communication.

It must be stressed at this point that although both groups of subjects showed significant increases in speech, they remained severely impaired in spoken language ability. By Follow-up III, 65% of the Bliss Users and 21.4% of the Makaton Signers were still unable to produce any spoken utterances during the recording sessions, while the children who were using spoken words, produced very few utterances on average when compared with normal speakers, and most of these were only 1 word long. These results justify the decision to introduce the children to augmentative systems of communication, since they show that although they made good progress in speech development over time, this improvement was in most cases not sufficient to allow speech to become their sole means of communication. Confirmation for this point is found in the results of comparisons between the augmentative communication samples and spoken language samples produced by the children at Follow-up III, particularly among the Bliss Users. It will be recalled that comparisons between the children's symbol/sign and speech output at baseline showed that the Bliss Users produced significantly more total utterances, which were also longer and more complex syntactically, when they used symbols than when they used spoken language. In contrast, the Makaton Signers produced utterances of similar number and length, when using BSL (Makaton) Signing and speech (see Chapter 32). Similar results were found when comparing the sign/symbol and spoken language samples which the children produced at Follow-up III.

Only 7 Bliss Users and 10 Makaton Signers produced at least 1 sign/symbol utterance <u>and</u> at least 1 spoken utterance during recordings in the final assessment period. The means and standard deviations of the syntactic and pragmatic summary measures for their symbol/sign and spoken language samples are presented in Appendix 33. In each group symbol/sign - speech difference scores were computed for each measure, and the mean difference scores in the Bliss and BSL (Makaton) groups were then compared using t-tests. These results are also presented in Appendix 33. The t-tests yielded significant results on the percentages of single- and multi-term utterances produced, on mean utterance length, and on the numbers of LARSP Stage II clauses and phrases and organization devices produced, indicating that the mean symbol-speech difference scores for the Bliss group were significantly greater than the mean sign-speech difference scores for the Makaton group. Examination of the means and standard deviations presented in Appendix 33 reveals that those Bliss Users who were using both symbols and speech produced more utterances, more spontaneous utterances, and longer and more complex utterances, in their Bliss language samples than in their spoken language samples. In contrast, the 10 Makaton Signers produced utterances of similar number and complexity when using signs and speech. The reader is further reminded that all 20 Bliss Users produced expressive language output in symbols at Follow-up III, but only 7 of these children produced any spoken utterances; whereas in the Makaton group 13 of the 14 children produced sign output and 11 produced spoken utterances. These findings parallel the results for the baseline comparisons between the children's sign/symbol and spoken language samples.

The findings thus show the continuing value of augmentative systems for the cerebral palsied children in the Bliss group, in that they were able to express far more through Bliss than they were able to express with speech. In the case of the Makaton Signers, who were less physically handicapped and had greater oral motor ability, signing did not facilitate greater expressive language output than was possible with speech. However, as was suggested in the discussion of the baseline results, the simultaneous speech and sign training may have enhanced their use of <u>both</u> signs and speech.

41.2 Changes in Spoken Language in Subgroups of Bliss and BSL (Makaton) Users

Although the improvement shown by the Bliss and Makaton groups in spoken language ability is encouraging, the results show wide variability in the progress that was made. Cerebral palsied children do not constitute a homogeneous group and it is therefore important, when examining progress in speech, as in sign/symbol use, to consider possible differences in the rates of change in various subgroups of children. This may help to explain why speech develops in some children who are receiving augmentative communication training, but not in others. One variable which might be relevant is IQ. To examine the role of IQ in speech development, each of the Bliss and Makaton groups was subdivided into a 'low-IQ' group (IQ of 55 or below) and a 'higher-IQ' group, and their rates of change on the measures of verbal ability were compared using 2-way analyses of variance. Table 49.1 presents the mean scores and standard deviations of the linear trends on these measures for each group, while Table 49.2 provides the results of the statistical tests for differences due to the main effects of Bliss/Makaton Group and IQ, and their interaction Group X IQ. Since differences between the Bliss and BSL (Makaton) groups on these measures have already been described, the present discussion will be confined to an examination of the IQ and interaction effects.

Table 49.1: Linear Trends in the 'Low-" and 'Higher-IQ' Bliss and Makaton Users on the Measures of Spoken Language

	Bliss Group		BSL (Makaton) Group	
	Low-IQ (n = 4)	Higher-IQ (n = 16)	Low-IQ (n = 8)	Higher-IQ (n = 6)
No.of intelligible words	- 1.50± 1.73	-1.38± 2.16	- 1.38± 1.92	- 2.33± 2.88
Reynell Expressive Scale	- 6.50±16.22	-6.56±14.36	-14.88± 13.40	-34.33±25.63
Total spoken utt.s prod.	-20.25±40.50	-8.56±17.00	-41.88± 48.00	-72.17±81.70
MLU of spoken utt.s	0.21± 0.43	-0.64± 1.43	- 1.08± 2.33	- 1.27± 2.03

Table 49.2: Changes in Spoken Language Ability Over Time - F-ratios for Bliss/Makaton Group and IQ Effects

	Bliss/Mak. Group adj. for IQ	IQ adj. for Bliss/Mak. Group	Interaction
No. of intelligible words	0.43	0.26	0.40
Reynell Expressive Scale	10.44*	2.41	2.22
Total spoken utt.s produced	8.16*	0.34	1.49
MLU of spoken utt.s	1.81	0.57	0.24

As can be seen in Table 49.1, the 'higher-IQ' Signers made more progress on average than the 'low-IQ' Signers on all 4 measures of spoken language. In the Bliss group the mean linear trends in the 'low-' and 'higher-IQ' groups were similar for the number of intelligible words and Reynell Expressive Scale, while the 'low-IQ' subgroup made more progress on average on the number of spoken utterances produced, and the 'higher-IQ' group made more progress on MLU. However, none of these differences reached significance on statistical testing, and there were also no significant Group X IQ interaction effects. These results indicate that neither IQ group had a better prognosis for improvement in spoken language than the other.

One variable which has been found to play an important part in accounting for differences in response to verbal language training programmes, is the child's initial level of expressive language ability. Howlin (1979), for example, found that mute autistic children showed very little improvement in spoken language with training, whereas echolalic children and children who were at least at the single word stage of language development, were likely to do well in verbal language training programmes. The present Bliss and Makaton Users were therefore divided into 2 groups on the basis of the number of intelligible words they used at baseline. The first group consisted of mute children (i.e. with 3 intelligible words or less), and the second group consisted of speaking children (with more than 3 intelligible words). There were 16 Bliss Users and 6 BSL (Makaton) Users in the first group, and 4 Bliss Users and 8 BSL (Makaton) Users in the second group. Once again, analysis of variance procedures were used to examine differences between the mute and speaking children in the linear trends identified on the measures of spoken language.

As can be seen in Table 49.3, there were no significant Bliss/Makaton Group effects, nor any Group X Speech interaction effects. However, there was a highly significant Speech effect for progress on the number of intelligible words that were used, on the Reynell Expressive Scale and on the total number of spoken utterances produced in recording sessions. The

Table 49.3: Changes in Spoken Language Ability Over Time - F-ratios for Bliss/Makaton Group and Speech Effects

	Bliss/Mak. Group adj. for Speech	Speech adj. for Bliss/Mak.Group	Interaction
No. of intelligible words	0.00	5.50*	0.72
Reynell Expressive Scale	1.96	26.65**	0.01
Total spoken utt.s produced	2.81	19.49**	2.51
MLU of spoken utt.s	0.17	3.22	0.03

Speech effect for progress in MLU just missed significance. Examination of the mean linear trends on these measures (see Table 49.4) shows that in each case the children who had some speech at baseline made considerably more progress over time than the children who were mute. It would thus appear that rates of change on the spoken language measures accompanying sign and symbol training depended very much on the children's initial

Table 49.4: Linear Trends in the Mute and Speaking Bliss and Makaton Users on the Measures of Spoken Language

	Bliss Group		BSL (Makaton) Group	
	Mute (n = 16)	Speaking (n = 4)	Mute (n = 6)	Speaking (n = 8)
No.of intelligible words	1.75±2.11	- 1.25± 2.75	1.17± 2.99	- 0.25± 2.32
Reynell Expressive Scale	-1.38±8.29	-27.25±15.37	-8.00±12.31	-34.63±19.46
Total spoken utt.s produced	-3.44±9.89	-40.75±35.45	-9.17±13.73	-89.13±65.23
MLU of spoken utt.s	-0.26±0.80	- 1.32± 2.62	-0.44± 1.36	- 1.70± 2.51

speech levels, with change being most marked in the children who at baseline were able to use more than 3 spoken words. The children classed as mute at baseline did show some improvement on the speech measures with time (see Table 49.4), but the improvements were far less striking in their case.

It will be recalled that at baseline performance on the measures of verbal expressison correlated significantly, and negatively, with severity of physical handicap, and with the ratings of feeding difficulties and extent of impairment of the oral musculature. Understandably, the number of children involved is too small to make firm predictions about which augmentative system users will show improved speech skills with training, and which will not. However, the present findings lead one to predict that a child who can be stimulated to the correct production of single words, and with limited feeding difficulties and oral musculature impairment, will make more rapid progress in speech development following on simultaneous communication training, than a child who is mute. This conclusion accords with the claims made by Carr (1979; Carr and Dores, 1981; Carr and Pridal, 1984) and Konstantareas, Webster and Oxman (1979), which were based largely on anecdotal accounts from sign training studies with autistic children, that children who were mute and had poor initial verbal imitation skills tended to acquire signing but not speech, while children with relatively good verbal imitation skills or echolalia showed improved expressive and/ or receptive speech, as well as gains in signing, when exposed to simultaneous communication programmes. One explanation for these findings is that when children are proficient at attending to and discriminating among auditory stimuli (indicated by relatively high initial verbal scores), speech and sign potentiate each other in expressive learning; whereas children who are mute respond poorly to speech and so show limited progress in its acquisition (Kiernan, 1983a). Clearly, however, there is an added factor to bear in mind in the case of the cerebral palsied children constituting the present sample, namely the neuromuscular status of the oral musculature.

Further examination of the factors discussed above, and of other child characteristics which may predict development in spoken language following on augmentative communication training, will be undertaken in Part VII.

Chapter 42. Social Development, Attention and Behaviour Over Time

Table 50.1 presents means and standard deviations for each assessment period on the following socialization and behavioural measures: the children's social competence as rated by parents on Gunzburg's (1977) Socialization Scale; a measure of attentional deficits, derived from observing each child during teacher-led structured group activities; and

Table 50.1: Means and Standard Deviations for the Socialization and Behavioural Measures

		Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)	
Measure	Occasion	Mean	S.D.	Mean	S.D.
P-A-C Socialization Scale	1	12.20	3.90	13.86	3.13
	2	13.60	4.19	14.57	3.74
	3	14.20	4.43	15.36	3.57
	4	15.20	3.50	15.79	3.49
Attentional Deficits - total	1	15.20	8.15	18.93	5.60
	2	12.21	7.30	16.71	6.18
	3	11.80	7.33	15.93	6.01
	4	10.53	7.14	16.43	7.10
Needleman Questionnaire	1	4.55	2.09	5.21	1.97
	2	3.80	1.99	4.21	1.97
	3	3.50	2.14	4.07	1.77
	4	3.20	1.91	3.64	1.74
Rutter Teacher Questionnaire	1	5.25	3.23	6.07	3.58
	4	4.50	4.61	5.36	4.20
Rutter Parent Questionnaire	1	10.50	3.59	13.64	5.79
	4	10.50	3.35	14.00	7.29

the Needleman Questionnaire (Needleman, Gunnoe, Leviton et al., 1979), which provides a measure of undesirable classroom behaviours. The Rutter Teacher and Parent Questionnaires were administered at baseline and Follow-up III only, and mean total scores on these scales are also shown in Table 50.1. More detailed descriptions of the above scales and their derivations can be found in Chapter 19.4.

The linear trend for the Socialization Scale was highly significant in both the Bliss group (t = 6.08, d.f. = 19, P < .001) and the BSL (Makaton) group (t = 5.32, d.f. = 13, P < .001), indicating continued improvement in social competence over time. Significant linear trends were also identified in both groups on the Needleman Questionnaire (Bliss group: t = 3.18, P < .01; Makaton group: t = 5.36, P < .001) and, in the Bliss group, on the attentional deficits measure (t = 2.77, P < .02). In the case of the Makaton group, the linear trend on this latter measure was just short of significance (t = 1.80). Examination of Table 50.1 shows that, with one exception, there were fairly steady decreases on these measures of undesirable behaviour over time. There were, however, no significant differences between total scores on the Rutter Teacher and Parent Questionnaires from baseline to Follow-up III in either the Bliss group (Teacher Quest.: t = 0.70, d.f. = 19; Parent Quest.: t = 0.00 d.f. = 19), or the BSL (Makaton) group (Teacher Quest.: t = 1.00, d.f. = 13; Parent Quest.: t = 0.23, d.f. = 13). Furthermore, the percentages of children obtaining deviant scores on these questionnaires remained almost identical at baseline and Follow-up III. On the Teacher Questionnaire, 25% of Bliss Users and 14.2% of Signers attained deviant scores at baseline, and 25% of Bliss Users and 7.1% of Signers obtained deviant scores at Follow-up III. Similarly, on the Parent Questionnaire 35% of Bliss Users and 50% of Signers obtained deviant scores at baseline, and 25% of Bliss Users and 57.1% of Signers obtained deviant scores at Follow-up III. Tables 50.2 and 50.3 show the changes in the numbers of children who obtained deviant and non-deviant scores on these scales from the first to the final assessment periods. It can be seen that most children obtained the same classification (i.e. scoring above or below the cut-off point for deviance) at each of the 2 assessment periods. And of the children whose designation changed over time, similar numbers moved from the non-deviant to deviant category as moved from the deviant to non-deviant category. The McNemar test, which was used to test for differences in changes in the proportions of subjects from one category to the other, showed no significant changes in either the Bliss or Makaton group on these 2 scales.

Comparisons between the Bliss and Makaton groups in terms of their rates of change on the above measures revealed no significant differences between the linear trends identified on the Socialization Scale (t = 1.41, d.f. = 32), the observation of attending ability (t = 1.15, d.f. = 32), and the Needleman Questionnaire (t = 0.31, d.f. = 30.72). There were also

Table 50.2: The Rutter Teacher Questionnaire - Changes in Deviant|Non-Deviant Designations from Baseline to Follow-up III

Bliss Group (n = 20):

		Follow-up III Above cut-off	Follow-up III Below cut-off
Baseline	Below cut-off	3	12
	above cut-off	2	3

BSL (Makaton) Group (n = 14):

		Follow-up III Above cut-off	Follow-up III Below cut-off
Baseline	Below cut-off	0	12
	above cut-off	1	1

Table 50.3: The Rutter Parent Questionnaire - Changes in Deviant|Non-Deviant Designations from Baseline to Follow-up III

Bliss Group (n = 20):

		Follow-up III Above cut-off	Follow-up III Below cut-off
Baseline	Below cut-off	1	12
	above cut-off	4	3

BSL (Makaton) Group (n = 14):

		Follow-up III Above cut-off	Follow-up III Below cut-off
Baseline	Below cut-off	3	4
	above cut-off	5	2

no significant differences between the groups in mean change scores on the Rutter Teacher and Parent Questionnaires from baseline to the final follow-up ($\underline{t}$ = 0.03, $\underline{d.f.}$ = 30.70; $\underline{t}$ = 0.21, $\underline{d.f.}$ = 18.81). It can therefore be concluded that the 2 augmentative communication systems did not result in different amounts of improvement in social skills, attending ability and behaviour.

Thus, in spite of their handicaps, the children showed encouraging progress in social skills, attending ability and general classroom behaviours, although there were no changes on the Rutter Scales for emotional and behavioural disturbance. Other studies, too, have reported improvements in these areas for children who were included in sign and symbol training programmes; although most of these reports described such changes only in impressionistic terms, with no systematic observations or data to support their claims (eg. Benaroya, Wesley, Ogilvie et al., 1977; Daniloff and Shafer, 1981; Hodges and Deich, 1979; Walker, 1978). These investigators have suggested that the improvements found can be attributed to the fact that the children were able to communicate their needs and desires more effectively with augmentative systems, and were thus less frustrated. The ability to communicate is clearly also instrumental in promoting social development. However, a major difficulty with such reports, and with the present investigation, is that they lack control groups. In the absence of controls, one must be weary of attributing all gains that occur to the sign and symbol training programmes. As has already been pointed out, these improvements may be the result of increased attention to the children, the introduction of a more interesting regimen, enhanced interactions with adults, the introduction of a structured communication programme of some sort, or indeed they may simply be due to the passage of time and the children's own maturation. Thus, on the basis of the present findings, it can be concluded only that increases in desirable social and classroom behaviours occurred in the context of the sign and symbol training programmes, and that the changes found did not depend on the type of augmentative system introduced, since there were no significant differences between the amounts of improvement shown by the Bliss and BSL (Makaton) groups. Correlational procedures were used to examine more closely possible links between the improvements in social competence, concentration and behaviour, and the improvements that were found in the acquisition and use of signs and symbols. As can be seen in Appendix 34, in the Bliss group there were significant correlations between improved performance on the Socialization Scale and the Needleman Questionnaire, and increases in the total number of symbol utterances produced. And in the BSL (Makaton) group there were significant correlations between improvement on the Socialization Scale, and increases in mean length of sign utterances and in the extent to which the children communicated with teachers and used signs at school. The correlation between decreases in scores on the Needleman Questionnaire and increased communication with teachers just missed significance in this group. However, none of the other correlations were significant, suggesting that there was no clear-cut relationship between improvements in the use of Bliss/Makaton and increases in desirable classroom behaviours, socialization and concentration. The reader is reminded that at baseline, too, there was no clear suggestion of an association between successful use of the augmentative systems and better social and behavioural adjustment.

Chapter 43. Progress in Reading

At baseline, none of the BSL (Makaton) Users and only 4 of the Bliss Users were able to attain some score in reading on the Picture Aided Reading Test (P.A.R.T.) (Hamp, 1975). All 14 Makaton Signers were still non-readers by Follow-up III, when the children had a mean chronological age of 7 years 6 months. However, in the Bliss group the number of readers rose from 4 to 9 (45% of the sample) by the time of final assessment. This change in the proportion of subjects from non-readers to readers just missed significance on the McNemar test ($\underline{P}$ = .063). The discrepancy in reading ability between the Bliss and Makaton groups can no doubt be accounted for in terms of the significant differences between their cognitive and language comprehension levels.

Table 51.1 shows the numbers of Bliss Users who were able to read at each assessment period, together with their mean reading ages and the numbers of words they correctly identified on the P.A.R.T. It can be seen that by Follow-up III the 9 readers obtained a mean reading age of 6 years 1 month (S.D. = 9.39 months), and they were able to correctly identify a

Table 51.1: The Bliss Group - the Numbers of Readers at Each Assessment Period

	Baseline	Follow-up I	Follow-up II	Follow-up III
No. of readers	4	6	5	9
Reading Age (months)			(information missing for 1 child)	
mean	66.25	69.33	75.60	73.00
S.D.	0.96	3.08	7.70	9.39
No. of words read				
mean	1.25	3.67	9.00	6.89
S.D.	0.96	2.16	6.04	7.64

mean of 6.9 words on the test (S.D. = 7.64). Their mean chronological age at this point was 7 years 11 months (S.D. = 11.29). These figures indicate that the readers were still only at the beginning stages of the acquisiton of reading skills, and were on average reading at well below the levels expected for their chronological ages. A discussion of the factors likely to account for the poor reading attainment found in these and other groups of cerebral palsied children is presented in Chapter 35. It is, however, evident that the children in the Bliss group <u>did</u> make steady progress in this area. For further confirmation of this point, the reader is referred to Table 51.2, which shows that the 3 children who obtained scores on the

Table 51.2: Reading Ages of the Three Children who Obtained Scores on the P.A.R.T. at Every Assessment Period

Reading Age (months)	Baseline	Follow-up I	Follow-up II	Follow-up III
mean	66.00	70.33	78.00	78.50
S.D.	1.00	3.22	9.00	10.54

P.A.R.T. at every assessment period, made continued improvement on this test, and progressed in their reading ages by an average of 1 year over the 1½ years of the study. Data on a fourth child, who was also reading at baseline, were excluded from the table since information on her test performance at Follow-up II was missing. Interestingly, these results parallel the findings of Montgomery and Hall (1980), whose 6 physically handicapped subjects progressed in reading age by 7 months average growth over a 7-month period of augmentative communication training. Prior to the study, these children had demonstrated an average growth of only 1 month per year in reading comprehension.

In view of the absence of controls, it is not possible to draw any conclusions about the possible contribution of symbol training to the Bliss Users' progress in reading. In an attempt to identify factors that may be of relevance, the 9 Bliss Users who were reading by Follow-up III were compared with the 11 non-readers on a host of variables assessed at baseline and at the final testing period, including cognitive and language levels and the acquisition and use of symbols. The results of these comparisons are presented in Appendix 35. It will be recalled that a similar approach was adopted at baseline (see Chapter 35), and indeed the present findings confirm those that were reported earlier. The children who were reading at Follow-up III achieved significantly higher mean scores than the non-readers, both at baseline and at final follow-up, on the measures of cognitive abilities, language comprehension, classroom behaviour and concentration, and on the number of symbols acquired at the receptive and expressive levels. The 2 groups did not differ significantly on any of the baseline and final follow-up measures of expressive spoken language, which would seem to confirm the conclusion reached at baseline that the lack of productive experiences with speech is not necessarily an obstacle to the acquisition of reading skills. Moreover, the readers and non-readers did not differ significantly in their communicative use of symbols at baseline or Follow-up III, which would seem to suggest that the acquisition of this augmentative system of communication was not instrumental in facilitating their progress in reading.

PART VII: PREDICTING COMMUNICATIVE ABILITIES AND USE OF AUGMENTATIVE SYSTEMS AT FOLLOW-UP

Chapter 44. Introduction

On average, the Bliss and BSL (Makaton) Users made steady improvement in the numbers of symbols and signs they acquired over the 4 assessment periods. There were also improvements in the number and complexity of symbol and sign utterances produced, and in spoken language ability, although in some cases these were rather modest. Comparisons between the 2 groups revealed very few differences in baseline performance and in progress over time, and (with only one exception) the differences that were found disappeared once group differences in cognitive, language and physical abilities were taken into account. However, within each group the results showed wide variability in the progress that was made, and not all the children responded to training in the same way. Although the number of children involved in the study is too small to make firm predictions about outcome, the analyses undertaken in this section will, it is hoped, give some indications of subject, school and home characteristics that are particularly relevant to progress in sign/symbol use and the development of speech. Identifying such predictive indicators of success in augmentative communication programmes would clearly be helpful to teachers and therapists in being able to predict which children are most likely to benefit from which type of training. Such indicators could also be used to determine priority for training, to group children with similar relevant abilities for instructional purposes, and to identify those children who would need more intensive teaching input (Topper Zweiban, 1977).

This issue is particularly relevant in view of the concern that has been expressed by a number of writers (eg. Fristoe and Lloyd, 1978; Kiernan, Reid and Jones, 1982) about the arbitrary criteria that tend to be used in assigning children to different types of augmentative communication programmes. As was found in the present study and in Kiernan et al's survey, decisions on which system to teach which child appear to rest heavily on the child's level of cognitive ability and degree of motoric involvement, with the result that Blissymbolics is seen as most appropriate for severely physically handicapped children who are more able intellectually, whereas Makaton Signing is seen as appropriate for children with fewer physical disabilities but severe mental handicap. It is becoming increasingly clear that there are a host of other factors which may be equally or even more relevant to successful augmentative system use. As things stand at present, it is not possible to determine how a child will respond to a given system until it is actually tried. And even then, the present writer found that it can take 1 or 2 years for a teacher to reach the conclusion that a child is making insufficient progress in the system and that it should be abandoned and perhaps another system should be tried (see Chapter 36). The attempt to identify the factors, assessed at baseline, which are the most significant for subsequent progress in sign and symbol use and speech development will, it is hoped, help to clarify such decision making processes at the start of training.

Stepwise multiple regression procedures were used to identify those baseline variables that are useful in predicting outcome. In all, 9 dependent variables or outcome measures were selected for examination, encompassing 3 main areas of interest, namely sign/symbol acquisition and use, parent attitudes and extent of home and school use of the systems, and spoken language abilities. Because of the differences between the Bliss and Makaton Users in subject characteristics and augmentative system used, the regression analyses were performed for each group separately. If all baseline measures were included in the analyses simultaneously, the results would be unreliable given the small sample sizes. Therefore, only those baseline variables which correlated significantly with each outcome measure were included in the regression analysis for that measure.

Chapter 45. Predictors of Symbol/Sign Acquisition and Use at Final Follow-up

The outcome measures of sign/symbol acquisition and use which were included in the regression analyses as dependent variables were: the number of signs/symbols acquired at the receptive level, the number of signs/symbols acquired at the expressive level, the total number of sign/symbol utterances produced during the recording sessions, and the mean length of these utterances (MSLU), all assessed at final follow-up.

Correlations between these 4 outcome measures and all the baseline variables in each of the Bliss and Makaton groups are presented in Appendix 36. In both groups, the outcome measures of vocabulary acquisition and utterances produced correlated significantly with baseline measures of cognitive and perceptual abilities (the Columbia MMS, the Pre-symbol Assessment Test and the Frostig DTVP), language comprehension (the EPVT and Reynell Comprehension Scale), motivation to communicate, and with most of the measures of sign/symbol acquisition and use assessed at baseline. In the BSL (Makaton) group, the outcome measures were also significantly, and positively, correlated with the baseline variables of motor imitation, use of gestures, symbolic play and physical and motor status, which is to be expected in view of the added manual requirements of the signing system.

In the Bliss group, the measures of physical - and also verbal - abilities correlated positively only with the total number of symbol utterances produced at outcome. This finding is likely to reflect the fact that the Bliss Users who were less severely physically handicapped (and thus also had greater control of the speech musculature) were physically able to indicate symbols in a speedier and more efficient manner, thereby transmitting a greater number of messages during the time-limited recording sessions. There were also some positive correlations between parents' attitude towards and use of the systems at home and the outcome measures. In contrast, extent of teaching and use of the systems at school did not correlate with the outcome measures, but this may have been due to the limited range of teaching input and exposure to the systems over all subjects at baseline.

Stepwise regression procedures were used in an attempt to identify those baseline measures which were the best predictors of outcome. In view of the large number of baseline variables and small sample size, only those variables which showed a significant correlation with each outcome measure were included as independent variables in the regression analysis for that measure. It must be pointed out that there is a danger with this approach, in that it does not allow for the identification of any suppressor variables which could be operating. To check on this possibility, all the regression analyses were repeated with the inclusion of all the baseline variables. However, the resulting sets of predictors were very similar to those which will be described below.

As can be seen in Table 52.1, in the Bliss group a combination of 3 baseline variables gave the best prediction for the number of symbols

Table 52.1: Regression Coefficients Giving the Best Prediction of Symbol Acquisition at Follow-up

Outcome Measure: No. of Symbols Understood

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
EPVT	1.416	0.902	0.565	
Comm. with teachers	89.908	31.292	+0.107	0.750
MSLU	53.759	24.018	+0.078	
	-90.722	43.876		

Outcome Measure: No. of Symbols Produced

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
EPVT	1.414	0.881	0.571	
Comm. with teachers	90.839	30.568	+0.111	0.757
MSLU	52.162	23.462	+0.075	
	-94.170	42.860		

acquired at the receptive and expressive levels at follow-up. For both these outcome measures, the English Picture Vocabulary Test was the first variable to enter the regression equation, accounting for 57% of the variance in each measure. The extent to which the child used Bliss in communication with teachers entered the equation second and explained an additional 11% of the variance in each outcome measure. The mean length of symbol utterances produced at baseline emerged as the third predictor and accounted for a further 8% of the variance. Together, these 3 baseline measures accounted for 75% of the variance in the measures of number of symbols understood and produced at the final follow-up.

Various measures of the extent to which the children used Bliss at baseline also emerged as significant predictors of Blissymbol use at final follow-up. The best prediction of mean length of symbol utterances (MSLU) at this time was given by a combination of the following 3 independent variables assessed at baseline: the use of Bliss to answer questions, the use of Bliss in conversations with teachers, and the extent to which children were exposed to Blissymbol use in the school setting (see Table 52.2). Together, these 3 measures explained 77% of the variance in MSLU at follow-up. For the outcome measure of total number of Blissymbol

Table 52.2: Predictors of Outcome MSLU and Total Symbol Utterances Produced

Outcome Measure: MSLU

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Use of symbols to answer questions	0.394	0.110	0.499	0.773
Use of symbols in conversation with teachers	0.397	0.110	+0.136	
Exposure to symbol use at school	0.365	0.118	+0.138	
	+1.519	0.275		

Outcome Measure: Total Number of Symbol Utterances Produced

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Mobility Scale	2.249	0.275	0.618	0.884
Use of symbols spont. to ask for objects	6.539	1.340	+0.205	
No. spont. symbol utt.s	0.447	0.155	+0.061	
	+17.430	1.555		

utterances produced, 3 baseline measures entered the regression equation. The P-A-C Mobility measure emerged as the most important predictor, accounting for 62% of the variance in outcome; the use of Bliss to ask for objects explained a further 21% of the variance, and the number of spontaneous Blissymbol utterances explained an additional 6% of the variance in outcome (see Table 52.2). In combination, these 3 independent variables explained 88% of the variance in outcome for the total number of symbol utterances produced.

In the Makaton group, 2 independent variables entered the regression equations to predict the outcome measures of numbers of signs understood and produced at follow-up (see Table 52.3). The Form Perception subtest of the Frostig Developmental Test of Visual Perception was the most important predictor, accounting for 75% - 79% of the variance in each of

Table 52.3: Regression Coefficients Giving the Best Prediction of Sign Acquisition at Follow-up

Outcome Measure: No. of Signs Understood

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Frostig Form Perception	3.144	0.582	0.787	0.881
Agility Scale	5.162	1.741	0.094	
	-97.628	19.333		

Outcome Measure: No. of Signs Produced

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Frostig Form Perception	3.130	0.706	0.747	0.826
Agility Scale	4.708	2.114	0.079	
	-99.319	23.473		

the 2 outcome measures, and scores on the P-A-C Agility Scale explained an additional 8% - 9% of the variance in these 2 measures.

A combination of visual perception and physical ability measures also constituted the best predictors of the total number of sign utterances produced by the Makaton group at follow-up. The Frostig Position in Space subtest entered the regression equation first, explaining 61% of the variance in this outcome measure; and performance on the P-A-C Mobility Scale explained a further 19% of the variance in this measure (see Table 52.4). On the other hand, MSLU of the signed utterances produced at follow-up was best predicted by a combination of negative scores on the verbal imitation and sound development measures, and positive scores on the total number of signed utterances produced at baseline. In combination these 3 variables explained 86% of the variance in MSLU at outcome (see Table 52.4).

To summarize, it was found that in the Bliss group language comprehension assessed on the EPVT and the use of symbols at baseline (in terms of

Table 52.4: Predictors of Outcome MSLU and Total Number of Signed Utterances Produced

Outcome Measure: MSLU

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Verbal imitation	-0.049	0.013	0.681	
Tot.signed utt.s produced	0.030	0.013	0.138	0.863
Sound development	-0.032	0.014	0.044	
	+1.303	0.115		

Outcome Measure: Total Number of Signed Utterances Produced

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Frostig Position in Space	1.113	0.251	0.612	0.805
Mobility Scale	2.948	0.893	0.193	
	-41.023	10.101		

MSLU and in communication with teachers) were the best predictors of subsequent Blissymbol acquisition. Baseline measures of the use of symbols in the school setting were also significant predictors of the total number and length of symbol utterances produced at follow-up. Mobility emerged as an additional predictor of total utterances produced; this is likely to reflect the fact that the Bliss Users who were less severely physically handicapped had greater opportunities to interact with others and also were able to indicate symbols in a speedier and more efficient manner, and were therefore able to transmit more (but not necessarily more complex) symbol utterances in the time-limited recording sessions. The predictors of sign acquisition and use in the BSL (Makaton) Group were rather different. In this group, visuo-perceptual skills as assessed on the Frostig DTVP, and manual and gross motor abilities on the P-A-C Agility and Mobility Scales, combined to give the best predictions of the number of Makaton Signs acquired receptively and expressively and of the total number of signed utterances produced in recordings at follow-up. Measures of the use of the system at baseline did not emerge as significant predictors of these outcome measures, as they did for the Bliss group, although total signed utterances produced was found to be a predictor of MSLU at follow-up. The other 2 predictors of MSLU - the verbal imitation and sound development scales - indicate that those children with better verbal abilities or potential for speech at the start, were less likely to produce complex signed utterances at follow-up. This is entirely as expected.

In each group of children, there were of course other independent variables which correlated significantly with symbol/sign acquisition and use at outcome, including one or more of the following measures: IQ, Reynell Expression and Comprehension Scores, imitative ability and use of gesture, motivation to communicate, other measures of baseline sign/symbol use, parent attitudes, and indices of behavioural disturbance and physical handicap. However, these variables did not contribute significantly to the regression equations. It must be pointed out that many of these baseline measures were highly intercorrelated, and under such circumstances only 1 or 2 would enter the regression equation and the remainder would be rejected. To take just one example, IQ was found to correlate significantly, if modestly, with baseline EPVT scores in the Bliss group, and with the Agility Scale in the Makaton group. Thus the present findings would not suggest that IQ, or measures such as the use of gesture or parental attitudes, were irrelevant to sign/symbol acquisition and use, but rather that these measures did not contribute anything more to the prediction of outcome than the variables already in the various regression equations. It should also be noted that the regression coefficients presented in the preceding tables are likely to be unstable because of the high intercorrelations among many of the independent variables, and they should therefore be regarded with caution.

On the basis of the present findings it can be concluded that, in addition to language comprehension and physical mobility, a significant predictor of future performance in Bliss programmes is communicative use of Blissymbols during initial training, as measured by the length of symbol utterances produced, the extent to which symbols are used in conversations, and the extent to which others use the system with the child at school. Deich and Hodges (1982), Remington, Light and Porter (1981), Saya (1980) and Song (1979) also found language comprehension test scores to correlate positively with subsequent symbol acquisition, while Silverman, McNaughton and Kates (1978) found existing measures of symbol acquisition and use to be the best predictors of subsequent performance. The fact that IQ did not emerge as the most significant predictor of the present subjects' symbol acquisition and use at outcome, coupled with the earlier findings that the severely handicapped subjects were able to learn and use at least some Blissymbols at baseline and showed significant increases on many of these measures over time, would appear to argue <u>against</u> the current practice in many schools of excluding low cognitive ability children from Bliss programmes purely on the basis of low scores on intelligence tests. One inference that might be drawn from the present findings is that almost any child could at least be tried on Bliss programmes, and that performance during initial training is likely to give an indication of long-term progress. Finally, the finding that extent of exposure to symbol use at school was a significant predictor of outcome MSLU is particularly noteworthy, because it confirms the view that teachers and speech therapists have an important positive role to play in influencing the user's progress in Blissymbol mastery.

The implications of the present findings for assigning children to signing programmes are altogether different, in that perceptual skills and gross and fine motor skills emerged as the best predictors of subsequent sign acquisition and use. These results provide support for Bryen and Joyce's (1985) claim that visual and motor deficits would seriously hamper efforts to teach signs. They further accord with Topper Zweiban's (1977) finding that manual dexterity was a reliable indicator of success in a signing programme. Patterns of poor performance in these areas are therefore likely to contra-indicate the use of signing with such children. Alternatively if such children <u>are</u> to be placed in signing programmes, they will require more intensive teaching regimens than tend to be used at present.

Although it would appear that there are different sets of predictors for each of the Bliss and Makaton groups, it must be stressed that the regression analyses present only the <u>best</u> predictors for each group out of a set of variables which are highly intercorrelated. The results thus emphasize the <u>differences</u> between the groups in terms of predictors of outcome. However, MSLU, the total number of utterances produced, and the use of augmentative communication at baseline, which all emerged as significant predictors in the Bliss group, also correlated significantly with one or more of the outcome measures of sign acquisition and use in the Makaton group. Similarly, the Frostig subtests and Mobility and Agility Scales emerged as significant predictors of outcome in the Makaton group, but also correlated significantly with one or more measures of outcome in the Bliss group (see Appendix 36). Thus outcome for the 2 groups is not so differently predicted as it would first appear.

<u>Chapter 46</u>. <u>Predictors of School and Home Use of Symbols and Signs</u>

Although the baseline measures of parental attitude to sign/symbol use and extent of exposure to the systems at home and at school did not emerge as significant predictors of Bliss and Makaton acquisition and use at outcome, they did correlate significantly with some of these outcome measures. On theoretical grounds, too, this teacher/parent support factor is coming to be recognized as an important part of what accounts for the success of intervention programmes (eg. Harris-Vanderheiden, Lippert, Yoder and Vanderheiden, 1979; Musselwhite and St. Louis, 1982). Without the commitment and involvement of parents and teachers, maximum generalization and reinforcement of the children's communicative skills cannot be assured, for clearly parents and teachers are already an important part of the process of communication with the child. It was therefore considered worthwhile to examine which factors assessed at baseline were related to the extent to which teachers and parents used the systems with the children and to parental attitudes to the systems at follow-up.

Correlations between these 3 outcome measures of school and home support for the systems and all the baseline variables are presented in Appendix 37.

There were very few correlates of the extent to which augmentative systems were used in the schools. In the Bliss group this outcome measure was positively correlated with the extent to which the children used symbols and were understood by teachers at baseline, and it was negatively correlated with social class and time spent in speech oriented language training. In the BSL (Makaton) group the measure was positively correlated with the children's physical status, level of symbolic play, and the extent to which they were understood by teachers. The absence of a greater number of correlates of school use of the systems may well be due to the failure to include more relevant measures, such as teacher attitudes and available resources within schools, among the baseline variables.

In view of this, the determination of predictors of school use of the systems at outcome is of limited value. As can be seen in Table 53.1, the only independent variable to meet the statistical criteria for entering the

<u>Table 53.1: Regression Coefficients Giving the Best Prediction of Extent of School Use of Augmentative Systems</u>

The Bliss Users:

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained
Use of symbols in conversation	1.200	0.362	0.379
	+1.900	0.256	

The BSL (Makaton) Users:

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained
Agility Scale	0.242	0.078	0.446
	+0.190	0.850	

regression equation in the Bliss group was the extent to which the children used Bliss conversationally at baseline, and it accounted for only 38% of the variance in the outcome measure. In the BSL (Makaton) group, the P-A-C Agility Scale was the only significant predictor of the extent to which schools used signs, and it explained only 45% of the variance in this outcome measure. This reinforces the earlier finding that significant motor deficits, especially those affecting the upper extremities, may be expected to hamper efforts to teach signs. However, these predictors are clearly of limited explanatory value. Future studies will need to explore attitudinal factors and practices among school staff much more closely, if workers in the field are to understand how best to create suitable environments within schools in which augmentative systems can become fully a part of school life.

The correlation and stepwise regression procedures provided rather more information on the variables influencing parent attitudes towards the systems, and their use of the systems at follow-up. In the Makaton group, favourable parental attitudes to the use of signs correlated significantly only with parental attitudes at baseline. However, in the Bliss group favourable parental attitudes correlated positively with the child's language comprehension level, communicative use of Bliss at baseline and severity of physical handicap, and negatively with number of siblings. And in both the Bliss and Makaton groups, actual use of the systems in the home was positively correlated with the children's cognitive, perceptual, gestural and/or language comprehension abilities, with the severity of their speech musculature impairment and poor verbal imitation skills, and (for the Bliss Users) with the extent to which they were motivated to communicate and used Bliss communicatively at baseline. In other words, where children were more able and more motivated to communicate, but had poor potential for speech communication, parents were more likely to appreciate the benefits of augmentative communication and so make use of the systems with their children.

Again, only those baseline variables which correlated significantly with parental attitude and use of the systems at outcome were included as independent variables in the regression analyses for these measures. For the Bliss group a combination of 2 variables gave the best prediction of parent attitudes (see Table 53.2). The child's use of symbols to indicate needs and wants entered the equation first, and explained 44% of the variance in outcome. The number of siblings the child had was the second variable to enter the equation, and explained a further 18% of the variance in the outcome measure. The only independent variable to significantly predict the extent of home use of Blissymbols at outcome was the Reynell

Table 53.2: Regression Coefficients Giving the Best Predictions of Parental Attitudes and Use of Blissymbolics

Outcome Measure: Parental Attitudes

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Use of symbols to indicate needs	0.776	0.236	0.437	0.615
No. of siblings	-0.265	0.095	0.178	
	+4.256	0.275		

Outcome Measure: Extent of Use of BLissymbols at Home

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained
Reynell Comprehension Scale	0.071	0.018	0.468
	-1.642	0.843	

Comprehension Scale, which accounted for 47% of the variance in this outcome measure (see Table 53.2). These results indicate that parents are less likely to have positive attitudes towards Bliss and to use the system in the long term where their children have poor language comprehension skills and make little communicative use of the system from the outset, and also where the parents have more children and thus presumably less time to devote to the handicapped child and to learning the augmentative communication system. Confirmation for these results can be found in a study by Silverman, McNaughton and Kates (1978), who also found that use of Blissymbols at home was related to the number of siblings and relative use of symbols and speech. The implications of these findings would be that with such families, speech therapists and teachers may need to work much harder at 'selling' the system and enlisting the cooperation of the family to use the system with the child.

Different sets of predictors were identified in the BSL (Makaton) group. In this group parental attitude to signing at baseline was the only significant predictor of parental attitude at outcome, and explained 37% of the variance in this measure (see Table 53.3). The best prediction for extent of use of signing in the home was given by a combination of the following 4 independent variables: the P-A-C Mobility Scale, severity of impairment of the speech musculature, verbal imitation ability, and behavioural disturbance on the Needleman Questionnaire. Together, these 4 variables accounted for 94% of the variance in outcome (see Table 53.3). These findings predict that where signers are more physically handicapped and have more behaviour problems, but less impairment of the speech musculature, parents are less likely to wish to implement the signing

Table 53.3: Regression Coefficients Giving the Best Prediction of Parental Attitudes Towards and Use of Makaton Signing

Outcome Measure: Parental Attitudes

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained
Parental attitudes	0.867	0.326	0.370
	+0.743	1.488	

Outcome Measures: Extent of Use of Signing at Home

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Mobility Scale	0.195	0.029	0.423	0.941
Impairment of Speech musculature	0.373	0.090	0.330	
Verbal imitation	-0.081	0.019	0.131	
Needleman Questionnaire	-0.119	0.041	0.057	
	+0.674	0.414		

system in the home. Again these findings have implications for practice, in alerting speech therapists and teachers about the kinds of families who might require particular attention and encouragement to use BSL (Makaton) with their language impaired child in the home environment.

Chapter 47. Predictors of Spoken Language Ability at Final Follow-up

The present study found that training in the use of Blissymbolics and BSL (Makaton) Signing did not inhibit speech development, but in fact was accompanied by improvements in the children's spoken language abilities (see Chapter 41.1). However, the results also showed wide variability in the progress that was made on these measures, and an important question concerns the characteristics of children who are likely to develop spoken language when exposed to simultaneous communication training, and those who are not. The analysis of covariance procedures used in Chapter 41.2 pin-pointed one factor that was relevant in this regard - in both the Bliss and Makaton groups improvement on the spoken language measures was most marked in the children who at baseline were able to use more than 3 spoken words. The children classed as mute at baseline also showed some improvements in speech over time, but the improvements were far less striking in their case. In the present chapter, stepwise regression procedures are used to examine the role of this variable and of all other child characteristics and background variables assessed at baseline in predicting the children's spoken language status at outcome. The 3 outcome measures of spoken language ability which were included in the regression analyses as dependent variables were: performance on the Reynell Expression Scale, the total number of spoken utterances produced during the recording sessions, and the mean morpheme length of these utterances (MLU).

Correlations between these outcome measures and all the baseline variables in each of the Bliss and BSL (Makaton) groups are presented in Appendix 38. In both groups the outcome measures were highly correlated with the 6 baseline measures of spoken language ability (the Reynell Expression Scale, the number of intelligible words, total sound development scores, the verbal imitation test, the total number of spoken utterances produced in recording sessions and their MLU), and with a number of baseline measures of symbol/sign acquisition and use. In the Bliss group, the Reynell Expression Scale and MLU at outcome also correlated significantly with physical ability, impairment of the speech musculature, and motor imitation test scores; while in the Makaton group the Reynell Expression Scale and number of spoken utterances produced at outcome correlated with motivation to communicate, language comprehension, social skills and attending ability assessed at baseline. As already stated, only those baseline measures which correlated significantly with each outcome measure were included as independent variables in the regression analysis for that measure.

The combinations of independent variables giving the best predictions for the 3 spoken language outcome measures are shown in Table 54.1 (for the Bliss group) and Table 54.2 (for the Makaton group).

Table 54.1: The Bliss Users - Regression Coefficients Giving the Best Prediction of Spoken Language Abilities at Follow-up

Outcome Measure: Reynell Expression Scale

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Reynell Expression Scale	1.048	0.129	0.881	0.932
Sound development	1.035	0.293	0.051	
	-4.938	1.423		

Outcome Measure: Total Number of Spoken Utterances Produced

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained
MLU	12.545	1.460	0.804
	- 0.107	0.918	

Table 54.1 cont.

Outcome Measure: MLU

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
MLU	1.754	0.223	0.776	
No.spoken utterances produced	0.332	0.057	0.071	0.929
No. intelligible words	0.492	0.095	0.066	
Impairment of speech musculature	-0.236	0.101	0.016	
	+0.581	0.223		

Table 54.2: The BSL (Makaton) Users - Regression Coefficients Giving the Best Prediction of Spoken Language Abilities at Follow-up

Outcome Measure: Reynell Expression Scale

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Reynell Expression Scale	1.461	0.118	0.810	
No. signs produced	0.366	0.071	0.120	0.977
No. signs understood	0.247	0.076	0.027	
Observation of attending be.	-0.316	0.114	0.020	
	+5.843	2.837		

Outcome Measure: Total Number of Spoken Utterances Produced

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained	
Reynell Expression Scale	1.129	0.700	0.703	
No. of signs understood	0.376	0.102	0.114	0.894
No.spoken utt.s produced	2.067	0.770	0.077	
	-13.369	5.177		

Outcome Measure: MLU

Variables in Equation	Reg.Coeff.s	S.E.of Reg.Coeff.s	Variance Explained
Reynell Expression Scale	0.105	0.015	0.816
	-0.071	0.171	

In the Bliss group, various combinations of baseline measures of spoken language ability gave the best predictions for all 3 outcome measures. The 2 measures that reached significance in predicting Reynell Expression Scale Scores at follow-up were the Reynell Expression Scale scores and the total sound development scores assessed at baseline. Together these 2 variables explained 93% of the variance in the outcome measure. For the total number of spoken utterances produced at outcome, only 1 baseline variable met the statistical criteria for entering the equation. This was MLU of the spoken utterances, and it explained 80% of the variance in outcome. The best prediction of MLU of the spoken utterances at follow-up was given by a combination of 4 variables - MLU, number of spoken utterances produced, number of intelligible words the children had and extent of impairment of the speech musculature, which together explained 93% of the variance in MLU at outcome.

In the BSL (Makaton) group, too, baseline measures of verbal language ability emerged as the most significant predictors of spoken language ability at follow-up. However, in this group the number of Makaton signs acquired at baseline also entered 2 of the regression equations as significant predictors. A combination of 4 variables gave the best prediction of performance on the Reynell Expression Scale at outcome - Reynell Expression Scale scores, the number of signs acquired at the expressive and receptive levels, and attending ability during structured classroom activities. Together, these 4 baseline variables explained 98% of the variance in outcome. For the total number of spoken utterances produced at follow-up, 3 independent variables entered the regression equation and accounted for 89% of the variance in the outcome measure. These were performance on the Reynell Expression Scale, the number of Makaton signs acquired at the receptive level, and the total number of spoken utterances produced. Outcome MLU of the spoken utterances produced was best predicted by performance on the Reynell Expression Scale at baseline, which explained 82% of the variance in this outcome measure.

Thus in both groups, measures of spoken language ability assessed at baseline (including scores on a test of language expression, communicative use of speech and integrity of the speech mechanisms) emerged as the best predictors of subsequent spoken language ability; but in the Makaton group sign acquisition and attending ability were also significant predictors of outcome.

The importance of existing levels of spoken language in predicting subsequent levels of speech mastery has been confirmed in the literature on verbal language training with autistic children (Howlin, 1979; Lovaas, Berberich, Perloff and Schaeffer, 1966), and also in the few sign training studies which have explored the question of predictors of subsequent progress. Konstantareas, Webster and Oxman (1979) and Daniloff and Shafer (1981) found that the use of verbalizations at the outset was a strong predictor of subsequent oral productions; and Carr (1979), reviewing a number of sign training studies with autistic children, concluded that children who were mute and had poor verbal imitation skills at the outset tended to acquire signing but not speech, whereas children with good verbal imitation skills or echolalia showed significant improvements in both signing and spoken language skills. These conclusions were confirmed in 2 subsequent controlled studies (Carr and Dores, 1981; Carr and Pridal, 1984). In the present investigation verbal imitation ability at baseline did not emerge as a significant predictor of subsequent spoken language level. However this measure did correlate significantly with all the speech outcome measures, as well as with the other baseline measures of spoken language ability. When independent variables are highly intercorrelated, only 1 or 2 will enter the regression equations, and the remainder will be rejected. On the basis of the present findings, then, it would appear that verbal imitation is just 1 of a number of measures of verbal ability which correlate with spoken language levels at outcome, and it may or may not emerge as a significant predictor of subsequent spoken language ability, depending on whether other measures of spoken language are included in the analysis.

The finding that the number of signs acquired at baseline was also a significant predictor of performance on the Reynell Expression Scale and total number of spoken utterances produced at outcome, has not been previously documented in the literature. In itself this result cannot be taken as evidence that signing facilitates spoken language expression, since the high multiple correlations that were found indicate only shared variance between the independent and outcome measures, and not that the variables are causally related. Nevertheless, this finding is <u>suggestive</u> of a facilitation effect for signing on oral production. Future controlled research on this question is needed.

PART VIII: DISCUSSION OF THE MAJOR FINDINGS AND THEIR IMPLICATIONS FOR AUGMENTATIVE SYSTEM TEACHING

Past training and research studies provided little information on augmentative system users' patterns of developing communication skills. They typically focused on the assessment of symbol/sign identification, but gave minimal attention to the syntactic and semantic form of augmentative communication, and to the question of how such systems are actually used in natural conversational environments. The results of the present investigation show that over an 18-month period severely language impaired cerebral palsied children were able to acquire at least some Blissymbols and Makaton Vocabulary signs, and that they were able to use these to express their thoughts in a way that was understood by others. However, despite the gains that were made, the study also revealed severe limitations in the repertoires of signs/symbols acquired, and all the children continued to show critical deficits in their communication and interaction skills at follow-up. The impression gained was a rather depressing picture of poor augmentative system use, with the children appearing primarily as respondents and passive partners in interactions and producing few utterances during recording sessions, these being mostly one sign or symbol long and mostly responses rather than spontaneous initiations.

At baseline, when they had been in training programmes for an average of 10½ months, the Bliss Users had acquired a mean of just over 50 symbols, and the BSL (Makaton) Signers were able to understand and produce a mean of approximately 30 signs. While the numbers of symbols and signs acquired increased significantly by Follow-up III (to means of just over 100 symbols and 70 signs), the children's vocabulary repertoires remained extremely limited in 'real terms', when compared with the thousands of words available to speaking 5- and 6-year-olds. One of the most striking features of their sign and symbol productions was the paucity of utterances produced during the semi-structured conversational recording sessions. Whereas speaking children would be expected to produce between 100 and 200 utterances in such recordings (Crystal, Fletcher and Garman, 1976), the Bliss and Makaton Users produced means of only 13 and 11 utterances respectively at baseline, rising to means of just 21 and 25 total utterances at final follow-up. Less than half of these utterances involved sign/symbol combinations. In addition to the picture of general delay on the syntactic measures, there were also many significant gaps in production, and complex syntactic structures and even some early structures (eg. negatives, commands, adjectives) were rarely or never used. Semantic analysis of the baseline sign and symbol utterances revealed similar types of relational meanings to those expressed by younger normal children, thereby highlighting the universality of the early 2-term semantic relations (Brown, 1973). But the children's subsequent combinations over the following 1½ years did not keep pace, in terms of their average length and complexity, with those reported for normal children, and most remained 1 or 2 signs/symbols long. Pragmatic analysis, too, revealed severe restrictions in the range of communicative functions that were expressed at baseline, with over 85% of all sign and symbol utterances expressing only 4 communicative functions. Again, there were few changes in the range and relative frequencies of communicative functions expressed at follow-up. It is thus clear that the communications expressed by the Bliss and Makaton Users did not parallel those produced by younger speaking children, and that progress in system use tended to be extremely slow. The children's utterances were quantitatively very different from those of normal speakers, but there were also some notable qualitative differences, with many early syntactic structures and pragmatic functions not being used at all.

Teachers' and parents' responses to the structured questionnaires were equally disappointing, in showing little generalization of sign and symbol use from formal training sessions to other school and home settings. At baseline the children rarely used the augmentative system in interactions with peers or adults other than parents and class teachers, and even then only 30% of them used the systems consistently with their parents and 15% used the systems reliably with speech therapists or class teachers. There were some qualitative improvements over time in motivation to communicate and in the use of signs and symbols to express needs and desires and to engage in conversations. However, by Follow-up III two-thirds of the sample were still rated as not using the systems reliably for these purposes at home and at school.

As discussed in earlier chapters, there are a number of factors that are likely to account for this picture of poor augmentative system use. Successful augmentative communication depends first and foremost on motivated communicative behaviour from the individual. But physically handicapped and minimally verbal children, such as those constituting the present sample, typically bring to social interactions well established patterns of non-communication and passivity. Their poor motivation is not difficult to understand in the light of their limited physical, cognitive and social experiences. Their needs and wants are often automatically provided for, so that they have no pressing need to communicate. They are seldom given opportunities to participate in decision making or to exert any meaningful control over their environments. Their attempts to make themselves understood may take great effort and often meet with failure, which is likely to discourage further communicative attempts. Moreover, adults may discourage them from attempting to communicate because this makes their care more time-consuming. As Yoder and Kraat (1983) point out, when an augmentative system is introduced the individual is suddenly being asked to shift from a passive role to one of initiating communications. It is little wonder that this cannot be achieved immediately.

Additional factors that may account for the poverty of the children's augmentative communication interactions relate to the unique features of the systems themselves. Symbol and sign transmission is considerably slower than speech (Foulds, 1980), which means that the faster verbal partner has the power to control interactions, while nonverbal communicators have difficulty in gaining conversational entry and contributing to interactions. They may reduce utterances to the least number of signs/symbols, or even use gestures or vocalizations instead of signs/symbols, to effect speedier communication. The verbal partner, too, is unlikely to encourage lengthy communications because they are so time-consuming. Augmentative system users also have restricted sign and symbol vocabulary sets, which means that they are capable of expressing much less, since many meanings and forms of expression are not available to them.

There can be little doubt, however, that a large part of the blame for the poor augmentative system use found in the present study lies with the training practices adopted in the schools. The present investigation found very limited exposure to sign and symbol training, with the Bliss Users receiving a mean of only 1 hour 49 minutes and the Makaton Signers a mean of 1 hour 23 minutes of formal teaching time per week at baseline. Moreover, only 1 Signer was exposed to signing throughout the school day; and for one-quarter of both the Bliss and Makaton Users, their only exposure to augmentative communication occurred in the formal teaching sessions. Over time there was a slight <u>decrease</u> in weekly teaching time. Exposure to the systems outside of formal sessions improved slightly, but by the final follow-up, 62% of the children were still receiving exposure to the systems wholly or largely in formal training sessions only. Furthermore, relatively few of the teachers or speech therapists (20% at baseline and 57% at final follow-up) reported using specific strategies to foster spontaneous use of the systems and generalization outside of formal training settings.

These findings carry implications for re-examining the augmentative communication training approaches currently in use. Clearly, the lack of continuous exposure to signs and symbols in schools will limit the rate of vocabulary acquisition and level of use obtained. If the children's long-standing communication deficits are to be overcome, and if their augmentative systems are to become fully functional, they will need to be involved in training for much longer than just 1½ hours a week, and schools will need to make a far greater commitment to the use of the systems, not only in formal sessions but throughout the school day. This would, after all, simply place the system user in a situation comparable with that of the normal child learning to talk. Language develops out of the continuous, ongoing process of an individual's daily interactions with others, and not through occasional and short-term efforts (Light, 1985). To this end, an important aspect of intervention programmes will involve ensuring the commitment of all school staff to using the systems, and training them in the skills required for receiving and transmitting sign/symbol messages, so that they can become effective models for the language handicapped child. Light (1985) points out that just as speaking children seem to acquire language best from hearing spoken language around them, so too sign and symbols users would be likely to develop more effective interaction strategies if exposed to skilled models of system use. Intervention will also probably need to address the question of helping verbal partners to modify their own patterns of interacting with language impaired children, including relinquishing their dominance over interactions and following the leads which the children present, providing the system user with sufficient opportunities, time and incentives to express sign/symbol messages, and discouraging the automatic provision of all the child's needs and wishes even before they are requested. The present study was unable to shed much light on predictors of the extent to which schools were prepared to implement the use of Blissymbolics and Makaton Signing in everyday school settings, since information on relevant background factors was not gathered. It is hoped that future research will be able to identify teacher attitudes and school practices which are likely to foster greater adoption of augmentative systems by the schools.

It is also likely that in order to overcome the nonverbal, physically handicapped child's well established patterns of passivity and poor motivation to communicate, more sophisticated teaching methods will be required than those which are currently employed - that is, techniques which focus on training actual communicative use within the natural environment. Strategies such as providing instruction across a range of people (including peers and strangers) in different settings, and creating situations where the child can use the augmentative system to express choice and exert control over naturally occurring events, can be valuable in achieving generalization of system use. Such approaches have already been successfully implemented in a few research studies (eg. Carr and Dores, 1981; Nietupski and Hamre-Nietupski, 1979; Oliver and Halle, 1982). Carr and Kologinsky (1983), for example, taught children to sign spontaneously for reinforcers, using a combination of prompting, fading and differential reinforcement techniques. They were successful in establishing spontaneous signing, which generalized across people and settings. There is a need for the further development and evaluation of such instructional techniques to foster greater spontaneous usage and generalization of symbol and sign use.

Recent work on the pragmatic and semantic features of emergent child language offers valid direction for the content of augmentative communication intervention programmes. A logical approach to increasing the functional language of augmentative system users is to focus from the start on teaching language forms and functions that have specified utility in the child's immediate environment (Oliver and Halle, 1982). For example teaching the request function is probably the best way to teach children that language is a useful tool for achieving personal goals. Other functions for which children normally use language include: establishing contact with others, manipulating others' actions, and getting information (Dore, 1977; Halliday, 1975). In the present study it was found that the children used their augmentative systems to express a very limited range of communicative functions. Teachers must therefore work on increasing the number and type of communicative functions expressed. The children must be encouraged to use these functions in situations where they are important and rewarding, taught how to by example, and given the means (i.e. appropriate vocabulary) to express them.

Problems with generalization have also to be interpreted in the context of potential problems of parent resistance to the use of augmentative systems. Little generalization can be expected if those within the child's home environment are unwilling to approve and make use of the systems. In the present study it was found that few parents made serious and consistent efforts to use Blissymbols and Makaton Signing. At baseline there were only 2 children (both using Makaton) who received frequent exposure to augmentative communication in the home environment. The 2 systems were not used at all in the homes of 35% of the Bliss Users and 25% of the Makaton Signers, while the remaining children received very limited exposure to the systems at home. On the question of parental attitudes to system use, it was found that, although no parents were totally opposed to the use of the systems, about 50% were reluctant to give them full approval. There was some improvement in parental attitudes over time, but by Follow-up III 32% of the parents were still reluctant to fully approve the use of the systems with their children. Moreover, at this point the systems were seldom or never used in the homes of 40% of the Bliss Users and 14% of the Makaton Signers, and they were only occasionally used in the homes of a further 40% of Bliss Users and 64% of Makaton Signers.

Clearly parents are unlikely to encourage their children to use augmentative systems if they themselves are not fully convinced of the need for them. The above findings therefore suggest that speech therapists and teachers need to work harder at enlisting the cooperation of parents and helping them to understand and accept these methods of communication, for example by demonstrating their advantages for the child, by stressing that the systems will not inhibit speech development (as was found in the present study), by providing them with information from past research on the benefits of such training, and by demonstrating success with other children using comparable systems. A variety of programme incentives could be introduced to increase family participation in sign/symbol use, for example agreeing performance contracts with the teacher, and deciding on special activities following specific gains in child performance (Baker, 1976). Arranging social occasions and teaching activities for the families of sign and symbol users could also help to promote positive attitudes towards the systems. Statistical analysis highlighted a number of factors, assessed at baseline, which predicted parental attitudes and the adoption of augmentative systems by families at final follow-up. In the case of the Bliss Users, it was found that where children had poor language comprehension and made limited use of Bliss at baseline, and where parents had larger families, they were less likely to use Bliss in the home. In the Signing group, it was found that where the children were more physically handicapped and had more behaviour problems, but less impairment of the speech musculature, parents were less likely to incorporate signing into the home environment. The implications are that such parents will need particular attention and encouragement from speech therapists and teachers, if they are to look favourably on augmentative communication and use the systems with their language impaired children.

An important question that needs to be addressed when deciding to implement an augmentative communication system with a given child, is the type of system to be selected. Concern about the arbitrary criteria that are often used in assigning children to symbol or sign programmes, was, in fact, one of the starting points for the present investigation. The results showed very few significant differences between the Bliss and Makaton groups in terms of acquisition and use of the systems at baseline, and in terms of improvements in sign and symbol use over time. Furthermore, with only one exception, the few differences which were found between the two groups disappeared when differences in IQ, language comprehension and severity of physical handicap were taken into account. These results suggest that, overall, neither augmentative mode has any obvious advantages over the other in terms of ease of acquisition or use. However, this does not mean that for individual children either system would be equally successful. Indeed, there was considerable variability among the children within each group, both in the number of signs/symbols acquired and the manner in which they were used at baseline, and in terms of the amount of progress that was made on these measures over time.

In the Bliss group,the most important predictors of symbol acquisition and use at outcome were the measures of language comprehension (on the English Picture Vocabulary Test) and the communicative use of symbols assessed at baseline. One inference that might be drawn from this is that almost any child could at least be started on a Bliss programme, and that performance during initial training is likely to give an indication of subsequent progress. It will be recalled that of the present subjects, the children assigned to the Bliss programmes were more severely physically handicapped but more cognitively able than the children placed in the Makaton programmes. This finding, which confirms Kiernan, Reid and Jones' (1982) survey results, indicates that schools see BSL (Makaton) as appropriate for severely mentally handicapped children, and that they tend to exclude low cognitive ability children from Blissymbol programmes because they believe that such children are unable to cope with Bliss. However, in the present study IQ did not emerge as a significant predictor of symbol acquisition and use at outcome. This finding, coupled with the fact that the severely mentally handicapped Bliss Users were able to acquire and use at least some Blissymbols and progress in their use over time, argues against the current practice of excluding children from Bliss programmes purely on the basis of IQ. As already noted, other indices of performance would appear to be more relevant to this decision.

In the BSL (Makaton) group perceptual skills and gross and fine motor abilities assessed at baseline emerged as the most significant predictors of subsequent sign acquisition and use. Moreover, in the case of the two children with whom Makaton teaching was eventually abandoned because of lack of progress, the children's extremely limited motor abilities were given as the primary reason. These findings would suggest that where children have limited motor and perceptual skills, they would be more likely to make progress if assigned to a symbol programme rather than to a signing programme. The above findings on predictors of outcome performance must await confirmation from future studies. Hopefully, as more information is gathered on this question, teachers and clinicians will become more precise in identifying children who will be likely to benefit more from one communication mode than another.

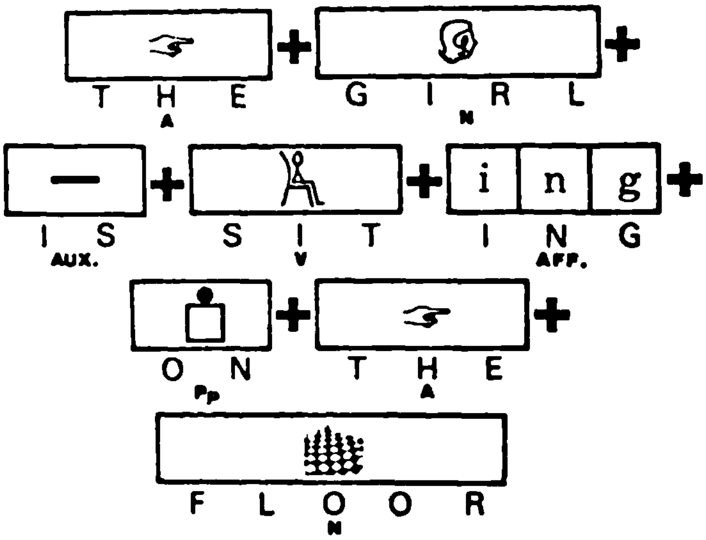
Other aspects of the children's functioning which were assessed at baseline and follow-up, included: levels of expressive and receptive spoken language, representational skills, social skills, attending ability and behavioural difficulties. One of the criteria for selecting the present sample of cerebral palsied Bliss and Makaton Users was that they had no speech or largely unintelligible speech, with no more than approximately 30 intelligible spoken words. But in addition to their limited spoken language, the children all also showed substantial receptive language impairment at baseline, as well as deficits in the understanding and use of gesture and symbolic play. Thus their linguistic deficits extended beyond the expression and comprehension of speech, into the areas of representational abilities and inner language. These deficits are not difficult to understand when considered within the context of their severe physical, cognitive and communicative handicaps. They also showed a high frequency of attentional deficits when observed in structured classroom activities, and higher rates of problem behaviours were reported by parents and teachers, when compared with children in the general population. In both the Bliss and Makaton groups there were significant improvements over the four assessment periods on the cognitive and visual perception tests, on the measures of language comprehension and use of gestures, and on the ratings of social skills, appropriate classroom behaviours and attending ability. Increased concentration and social interaction, and reduction in aggressive behaviour, have also been reported in other sign and symbol training studies (eg. Duncan and Silverman, 1977; Wherry and Edwards, 1983). However, even by the third follow-up period, the children remained severely impaired in all these areas when compared with normal children. Moreover, in the absence of control groups, it is not possible to attribute the increases that were found to the sign and symbol training programmes. It can be concluded only that gains in desirable behaviours and in cognitive and linguistic abilities occur in the context of such programmes, and that these gains do not depend on the type of augmentative system introduced, since there were no significant differences between the amounts of improvement shown by the Bliss and BSL (Makaton) groups on these measures.

The impact of augmentative communication systems on the user's speech output is crucial since, as Silverman (1980) points out, if they are found to have a deleterious effect in this area, teachers and parents might justifiably be opposed to their introduction if there is any chance that the child could learn to communicate with speech. In the present study, both the Bliss and Makaton groups showed increases in spoken language abilities over time, in terms of the number of intelligible words they used, performance on tests of language expression, and the total number of spoken utterances produced in recording sessions. These findings accord with earlier (largely anecdotal) reports of progress in vocalizations or speech accompanying sign and symbol teaching (eg. Daniloff and Shafer, 1981; Hobson and Duncan, 1979; Porter and Schroeder, 1980). However, even by the third follow-up period, the children's spoken language abilities remained extremely limited. At this time, 50% of the Bliss group and 29% of the Makaton group still had no more than 3 intelligible spoken words. This finding clearly justifies the teachers' and speech therapists' initial decision to place these children in augmentative communication training programmes. Again, in the absence of control conditions, it is unclear whether the gains that were found in the children's spoken abilities were due to the facilitative effects of sign/symbol learning, or to other factors such as increased attention and stimulation, the introduction of a structured language teaching programme, or to the children's own maturation. At this point, it can be concluded only that augmentative communication training does not hinder the development of speech. It must also be pointed out that not all the children improved in spoken language ability to the same extent. In both the Bliss and Makaton groups, the children's initial speech levels emerged as the best predictors of speech levels at outcome. But in the Makaton group, sign acquisition was also a significant predictor of outcome. This may be seen as suggestive of a facilitation effect of signing on oral production, but at present this claim must remain highly tentative.

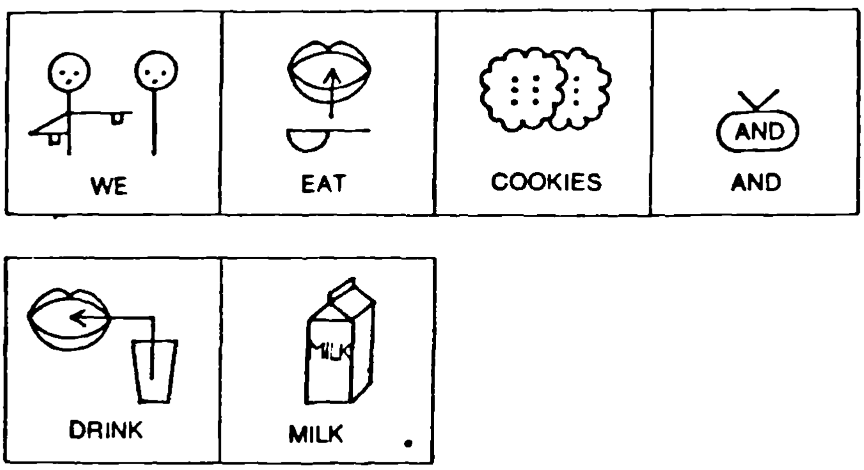
The finding that sign and symbol use does not hamper the development of speech will hopefully help to change the widely held view of augmentative systems as 'last resort' techniques, and serve to strengthen the argument for their early implementation with communicatively handicapped and high-risk infants, <u>in conjunction</u> with speech therapy. Unfortunately, many programmes defer the introduction of sign and symbol systems until children are of school age or even older, and have demonstrated several years of failure in traditional speech therapy (McDade, Simpson and Booth, 1980). In the present study, too, the children's average age when first introduced to Blissymbolics or Makaton Signing was 5 years 2 months. Given the importance of early language learning for cognitive, social and emotional development, the early implementation of augmentative training for children with severe expressive language impairment cannot be emphasized enough. In this way, years of frustration with traditional speech therapy approaches can be avoided, and the establishment of immature and limiting communication patterns may possibly be prevented (Archer, 1977).

APPENDIX 1: Graphic Examples of Symbol Systems

A. Peabody Rebus Symbols - an example of the use of Rebus symbols to construct the sentence "The girl is sitting on the floor" (from Clark, Davies and Woodcock, 1974)

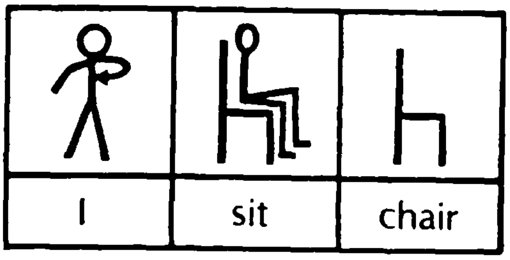


B. Picsyms - an example of the use of Picsyms to form the message "We eat cookies and drink milk" (from Carlson, 1982)



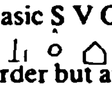
APPENDIX 1: Contd.

C. Makaton Symbols - (from Makaton Vocabulary Development Project, 1985)

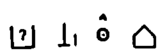


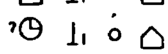
D. Blissymbolics - some examples of symbol utterances formed according to Bliss syntax (from Ross, 1979)

The syntax order used is of a basic S V O structure e.g.

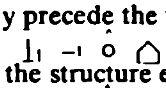
 I see (the) house

Question forms maintain this order but are preceded by the appropriate question symbol e.g.

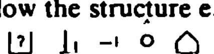
 (Do) I see (the) house?

 When (do) I see (the) house?

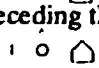
Negative symbols generally precede the verb e.g.

 I (do) not see (the) house

Negative questions follow the structure e.g.

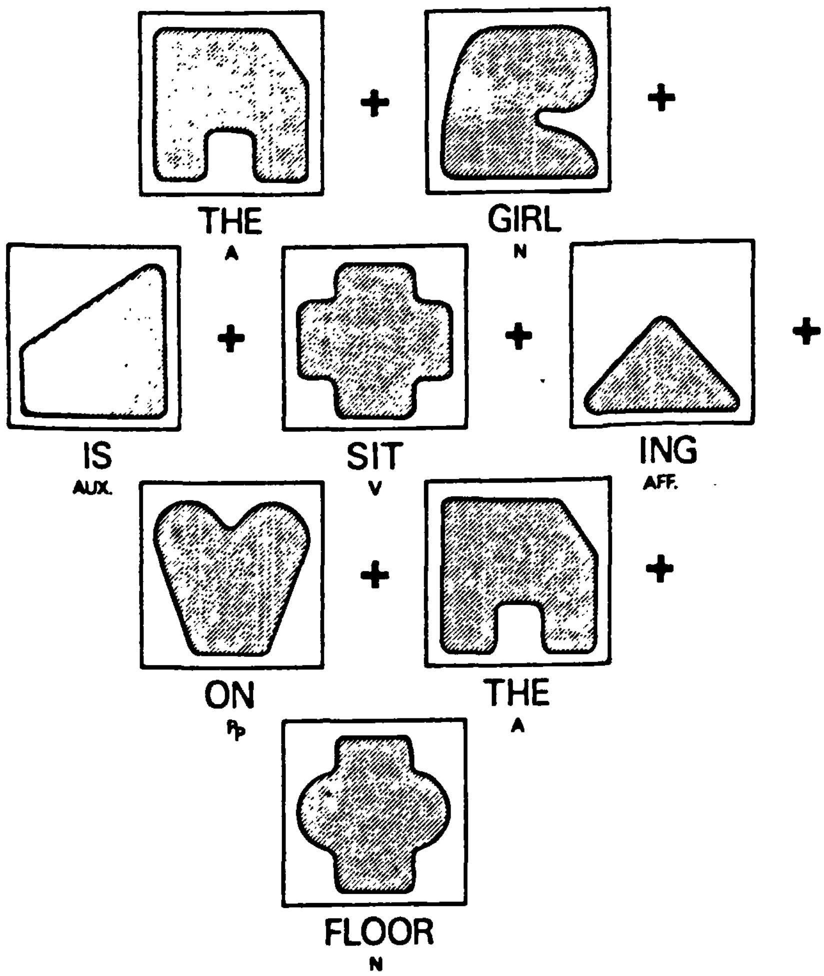
 (Do) I not see (the) house?

The imperative is formed by preceding the sequence of symbols by ' e.g.

 See (the) house!

APPENDIX 1: Contd

E. Non-SLIP - an example of the use of NON-SLIP plastic symbols to construct the sentence "The girl is sitting on the floor" (from Carrier and Peak, 1975)



APPENDIX 2: Analysis of the Experimental Adequacy of Alternative and Augmentative Communication Training Studies with Language Impaired Populations

Key:

Amer-Ind: Amer-Ind Gestural Code
ASL: American Sign Language
Bliss: Blissymbolics
BSL: British Sign Language
BSL(M): British Sign Language within the framework of the Makaton Vocabulary
Non-SLIP: Non-Speech Language Initiation Programme
OSL: Ontario Sign Language
PGSS: Paget Gorman Sign System
Premack: Premack- type abstract symbols
SE: Signed English
SEE: Seeing Essential English/Signing Exact English
TO: Traditional Orthography

(+) Adequate data presented (±) Data presented but inadequate (0) No information given

Section A: Sign Training Studies (where the sign system taught is not specified, the term 'signs' is used)

Year	Author(s)	No. Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1968	Chen (+ 1971)	26	Gesture + fingerspell.	0	±	0	0	0	±	0	0	0
1969	Levett (+1971a,b)	12	Mime	0	+	+	±	0	±	0	±	0
	Sutherland & Beckett	12	Signs	0	±	0	±	0	±	0	±	0
1970	Eagleson et al.	31	Amer-Ind ASL	0	±	0	0	0	±	0	0	0
	Hall & Talkington	30	Signs	+	±	±	±	0	±	±	±	0

Year	Author(s)	No. Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1972	Berger	9	Signs + fingerspell.	0	±	±	±	±	±	0	±	0
	Bricker	26	Signs	+	±	±	0	0	+	+	+	0
	Hoffmeister & Farmer	16	ASL	0	+	+	+	0	±	±	±	0
1973	Creedon (+1976,1981)	30	SE	0	+	±	±	±	±	±	±	0
	Miller & Miller	19	ASL	0	+	+	0	±	±	+	+	0
	Walker (+1977; Cornforth et al., 1974)	41	BSL	0	+	+	±	±	±	±	±	0
	Webster et al. (+1980)	1	OSL	0	+	+	±	±	±	0	±	0
1974	Skelly et al.	6	Amer-Ind	0	+	+	0	+	+	±	+	±
	Wilson	26	ASL	0	±	±	±	±	±	0	±	0
1975	Brookner & Murphy	1	SEE, TO	0	+	+	+	+	±	±	±	0
	Fenn & Rowe	7	PGSS	0	+	+	±	±	±	±	±	0
	Kopchick et al.	11	Signs	+	±	0	0	0	±	0	±	0
	Richardson	23	Signs	0	±	0	±	0	±	0	0	0
	Skelly et al.	14	Amer-Ind	0	±	0	0	0	±	±	±	0
	Topper	1	Gestures, ASL, Amer-Ind	0	+	+	+	±	±	0	±	0
1976	Balick et al.	5	Mime	0	±	±	0	0	±	0	±	0
	Bonvillian & Nelson	1	ASL	0	+	+	+	+	+	0	±	0
	Fulwiler & Fouts	1	ASL	0	+	+	0	0	±	±	±	0
	Grinnell et al.	?	SE	0	±	±	±	0	±	0	±	0

Year	Author(s)	No. Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of Training	Reliability of Measures
1976 Contd	Smeets & Striefel	1	ASL	0	+	+	+	0	+	+	+	+
1977	Benaroya et al. (+1979)	6	SE	0	±	±	0	0	±	±	±	±
	Duncan & Silverman	32	Amer-Ind	0	±	+	±	0	±	0	±	0
	Kahn (+ 1981)	12	ASL ?	+	+	+	±	0	±	±	±	0
	Linville	4	SE	0	±	+	±	±	±	0	±	0
	Konstantareas et al. (+ 1979, 1980)	5	OSL	0	+	+	±	±	+	+	+	+
	Salvin et al.	1	ASL	0	+	+	+	±	+	+	±	±
	Schaeffer et al.	3	SE	0	+	+	0	±	±	±	±	0
	Stremel-Campbell et al.	9	ASL, SE	0	±	+	±	±	±	±	+	0
	Topper Zweiban	15	Gestures	0	0	±	±	±	±	±	±	0
	Van Biervliet	6	Nonsense signs	+	±	+	±	±	+	+	+	+
1978	Bonvillian & Friedman	1	Signs	0	+	+	0	±	±	0	±	0
	Brady & Smouse	1	Signs	+	+	+	0	±	+	+	+	0
	Carr et al.	4	ASL	+	+	+	0	±	+	+	+	+
	Casey	4	SE	+	+	±	0	±	+	+	±	+
	Jarrow	1	ASL ?	0	0	+	±	±	±	0	0	0
	Kohl et al.	3	SE	+	±	±	±	0	+	±	+	+
	Konstantareas et al.	5	OSL	+	+	+	±	±	+	+	+	+
	Kotkin et al.	2	SE	0	+	+	+	±	+	+	+	+
	Reich	9	Gestures, signs	+	+	+	+	±	+	+	±	±
	Rowe	6	PGSS	0	+	±	±	±	±	±	±	0
	Salisbury et al.	2	ASL	0	+	+	±	±	±	0	±	0

Year	Author(s)	No. Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1979	Bailey & Tait	5	BSL(M)	0	±	+	±	±	±	+	±	0
	Hobson & Duncan	9	ASL ?	0	+	+	+	±	+	+	+	±
	Kohl et al.	4	SE	+	+	+	0	0	+	+	+	+
	Schlanger & Freimann	8	Mime	+	+	±	±	0	±	0	±	±
	Skelly	± 240	Amer-Ind	0	±	±	±	±	±	±	±	0
	Stuart-Smith & Wilks	4	Gestures	0	+	0	0	±	±	+	±	0
1980	Barrera et al.	1	ASL	+	+	+	0	±	+	+	+	+
	Beukelman et al.	30	Mime	+	±	0	0	0	+	+	+	0
	Culatta & Blackstone	3	ASL	0	±	+	+	+	+	+	+	0
	Griffith & Robinson	36	ASL	+	±	+	±	±	+	+	+	0
	McDade et al.	3	ASL	0	+	+	0	±	±	0	±	0
	Oxman & Blake	10	OSL	0	+	+	0	0	+	+	+	+
	Stull et al.	3	SE	0	+	+	±	±	±	±	±	0
1981	Carr & Dores	6	SE	+	+	+	+	±	+	+	+	+
	Cohen	1	ASL	0	+	+	0	±	±	0	±	0
	Daniloff & Shafer	21	Amer-Ind	0	+	+	±	0	±	±	+	0
	Faw et al.	6	ASL	0	+	+	+	±	+	+	+	+
	Kirshner & Webb	1	Amer-Ind, ASL	0	+	+	0	±	±	0	0	0
	Kohl	8	SE	+	+	+	±	±	+	+	+	+
	Konstantareas & Leibovitz	8	OSL	+	+	+	+	+	+	+	+	+
	Layton & Baker	1	ASL	0	+	+	+	±	+	+	±	±

Year	Author(s)	No.Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1981 Cont.	Reid	6	Signs	+	±	+	±	+	+	+	+	0
	Watters et al.	4	ASL	+	±	+	+	±	+	+	+	0
	Wells	3	ASL	+	+	+	+	±	±	+	±	+
1982	Hinerman et al.	1	SEE	0	+	+	±	±	+	+	+	±
	Karlan et al.	4	SE	0	0	+	0	+	±	+	+	0
	Kleinert & Gast	1	Signs	0	±	+	±	±	+	+	+	+
	Konstantareas et al.	1	OSL	0	+	+	+	±	±	0	±	0
	Layton & Helmer	37	ASL	+	+	±	±	±	+	+	±	0
	Oliver & Halle	1	SEE	+	±	+	±	±	+	+	+	+
	Schepis et al.	9	ASL	0	+	+	±	±	+	+	+	+
1983	Barrera & Azaroff	3	ASL	+	+	+	±	+	+	+	+	+
	Carr & Kologinsky	6	SE	+	+	+	+	±	+	+	+	+
	Duker & Michielsen	3	Signs	0	+	+	+	±	+	+	+	+
	Le Prevost	1	BSL(M)	0	+	+	±	±	±	±	+	±
	Luftig	40	ASL	+	±	+	+	0	+	+	+	+
	Remington & Clarke	2	Signs	+	+	+	±	+	+	+	+	+
	Rittenhouse	10	Signs	0	±	+	±	0	±	±	±	0
	Weller & Mahoney	15	SEE	+	+	±	+	+	+	+	+	±
	Wherry & Edwards	1	Signs	+	+	+	±	0	+	+	+	+
	Wilson	6	Aust.Sign Language	+	±	+	±	±	±	±	+	+
1984	Carr et al.	10	SE	+	+	+	+	±	+	+	+	+
	Duker & Morsink	4	Signs	0	+	+	±	±	+	+	+	+

Year	Author(s)	No.Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1984	Konstantareas	14	OSL	+	±	+	±	±	+	+	+	+
Cont.	McIlvane et al.	1	ASL, gestures	0	+	+	±	±	+	+	+	+
	Reid	36	Nonsense signs	+	±	±	±	±	+	+	±	0
	Romski & Ruder	10	SEE	+	+	+	0	±	+	+	+	+

Section B: Symbol Training Studies (where the symbol system taught is not specified, the term 'symbols' is used)

Year	Author(s)	No.Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1973	Glass et al.	7	Premack	0	+	±	0	±	±	0	+	0
	McDonald & Schultz	1	Pictures, TO	0	+	+	±	±	±	0	±	0
1974	Carrier (+ 1976)	180	Non-SLIP	0	±	±	±	±	±	±	±	±
	De Villiers & Naughton	2	Premack	0	+	+	0	±	±	±	+	0
	Hughes	4	Premack	0	±	+	±	±	±	±	±	0
	McLean & McLean	3	Premack	0	+	+	0	±	+	+	+	±
	Premack & Premack	1	Premack	0	±	±	±	0	±	0	+	0
	Ratusnik & Ratusnik	1	TO	0	+	+	0	+	±	±	±	0
	Vicker	22	Pictures, TO	0	±	±	±	±	±	0	+	0
1975	Harris-Vanderheiden et al. (+ 1979)	5	Bliss	0	+	+	±	±	±	±	±	0
	Wendt et al.	1	TO	0	±	+	±	±	±	0	±	0

Year	Author(s)	No. Subjects	System Used	Control/ Other Grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1976	Gardner et al.	5	Premack	0	+	0	+	±	±	+	±	0
	Hammond & Bailey	4	Bliss	0	+	+	±	±	±	0	±	0
1977	Beukelman & Yorkston	2	TO	0	+	+	±	±	+	+	+	±
	La Vigna	3	TO	0	+	+	±	0	+	+	+	0
	Murphy et al.	1	Pictures	0	+	+	+	+	+	+	+	±
	Reid & Hurlbut	4	TO, Photos	0	+	+	±	0	+	+	+	+
1978	Bailey & Hammond	2	Bliss	0	+	+	±	±	±	0	0	0
	Elder & Bergman	5	Bliss	0	+	+	±	±	±	±	+	0
	Hodges & Deich (+1979)	8	Premack	+	+	+	+	±	+	+	+	±
	Kuntz et al.	14	Premack, Rebus, TO	+	+	+	+	±	+	+	+	+
1979	Hughes	8	Bliss, TO	+	±	+	+	±	+	+	+	+
	Ross	1	Bliss	0	+	+	±	±	±	0	±	0
	Song	4	Bliss	0	±	+	±	+	±	±	±	0
1980	House et al.	10	Logographic symbols	0	+	+	+	±	+	+	+	0
	Montgomery & Hall	11	Symbols, electronic aids	0	0	+	+	±	±	+	0	±
	Porter & Schroeder	31	Non-SLIP	0	±	±	±	±	+	+	±	0
	Roodenburg & Smeets	1	Pictures	0	+	+	0	±	+	+	+	±
	Saya	10	Bliss	0	+	+	0	±	±	±	±	0
1981	Remington et al.	12	Premack	+	+	+	+	+	+	+	+	+
1982	Calculator & Dollaghan	7	Bliss	0	+	+	±	±	+	+	0	+

Year	Author(s)	No. Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1982 Cont.	Deich & Hodges	28	Premack	+	±	+	+	±	+	+	+	±
	Hurlbut et al.	3	Bliss, pictures	+	+	+	±	±	+	+	+	+
1983	Kalimikerakis	5	Bliss	0	0	±	±	0	+	+	+	0
	Lancioni	3	Pictures	0	+	+	+	±	+	+	+	+
1984	Meador	20	Abstract	+	±	±	±	0	+	+	+	0

Section C: Studies Using Signs and Symbols

Year	Author(s)	No. Subjects	System Used	Control/ Other grps	Diagnosis	Age	IQ	Language Measures	Outcome	Data Presentation	Description of training	Reliability of measures
1977	Wolf & McAlonie	8	ASL, Rebus	0	+	+	+	0	±	±	+	0
1979	MacDonald	2	BSL(M), Bliss	0	+	+	±	±	±	0	+	0
1980	Welch & Pear	2	Signs, Bliss	+	+	+	±	±	+	+	+	+
1984	Reid & Kiernan	7	Signs, Rebus	+	+	+	+	+	+	+	+	0

APPENDIX 3: Rating the Severity of Physical Handicap

(Rutter, Graham and Yule, 1970)

0 NONE - no handicap

1 SLIGHT - inability to perform strenuous or stressful activities such as sport, long hikes or physical education; restriction of such activities or difficulty or discomfort in their performance. This rating is used where there is a slight limp or where surgical shoes or other minor aids are worn.

2 MODERATE- inability to perform ordinary activities, restriction of such activities or difficulty or discomfort in their performance (but to an extent less marked than that covered by the 'severe' rating). This rating is used where there is a marked limp, where crutches are used, or where there is only a limited ability to walk distances. It is also used where the child is slow in his self-care but is independent or, at most, needs minor help with daily activities (e.g. washing back, brushing hair).

3 SEVERE - substantial help needed with daily activities such as dressing, undressing, feeding and washing. This rating is also applied where the child requires special transport or is unable to go out unaccompanied.

4 TOTAL OR ALMOST TOTAL INCAPACITY - the child needs help with all or nearly all daily activities.

APPENDIX 4: The Progress Assessment Charts -
Mobility and Agility Scales (Gunzburg, 1977)

GROSS MOTOR SKILLS

To be filled in by teacher / speech therapist

Name of Child: ______________________ Date: ________________

Filled in by: ______________________ School: ________________

Please tick the items which are applicable to the child. Most of the items draw on your knowledge and day-to-day observation of the child. For a few items, however, you may need to test whether the child is capable of performing the particular task under consideration.

Mobility

( ) 1. Balances head
When in upright position the infant/child is able to hold up head, so that it is not necessary to support it for him.

( ) 2. Sits with slight support.
The infant's/child's back should be strong enough that he can sit propped up by pillows for at least 5 minutes. Credit the item if the child can already sit unsupported.

( ) 3. Sits with fairly straight back and without support for short periods. Score this item if the child can sit up, not slouched over, without support for at least 5 minutes.

( ) 4. Pulls himself upright, stands when holding on.
Score this point if the child can pull himself into a standing position and maintain it while holding on for at least 3 minutes. Credit the point if he can already stand unsupported.

( ) 5. Gets about by creeping or crawling.
Credit if child can move about quite freely by creeping, crawling, or shuffling on his/her bottom. Credit also if the child has passed this stage and can walk without help.

( ) 6. Devises means of getting objects he wants.
Credit this item if the child is able to obtain what he wants when the task is more difficult than simply crawling across the floor, eg. when he/she sees a toy behind a chair and moves the chair to reach the toy.
The point here is that the child is able to move himself about in a purposeful fashion

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( ) 7. Walks with help.
Credit if the child can take at least 5 steps, either with his hand held, holding on to furniture or with a walking aid. Credit is also given if the child walks unaided.

Contd./

( ) 8. Walks unaided.
Child can take at least 5 steps without holding on and without a walking aid.

( ) 9. Walks upstairs, both feet together on each step.
Credit if the child can walk up at least 4 steps by himself. He may use a handrail, but must "walk" not "creep".

( ) 10. Walks downstairs, both feet together on each step.
Credit as in item 9.

( ) 11. Runs.
The child can run freely, flexing the knees with each step.

( ) 12. Walks upstairs, one foot per step, without support.
For this item the child should:
(a) be able to walk up 8-10 stairs by himself without using a handrail, <u>and</u>
(b) place one foot on the first step, the other on the second step and so on.

( ) 13. Walks downstairs, one foot per step, without support.
Score as for item 12.

<u>Agility</u>

( ) 1. Tries to reach an object with hands but overshoots.
Any attempt to reach for objects is sufficient to score here. Credit is also given if the child has passed this stage.

( ) 2. Manipulates objects.
Score this point if the child can manipulate either an object held in his hand or one that is hanging within his reach.

( ) 3. Reaches for objects by leaning forward.
Credit this point if the child, when in a sitting position, can lean forward to reach something, and in so doing does not over-balance. Score the item even if he does not attain the object.

( ) 4. Throws objects to floor.
The child, sitting in a chair, deliberately throws toys etc. to the floor. Credit the item also if the child has passed this stage.

( ) 5. Looks for fallen objects by bending over.
When the child is sitting in a chair and drops objects over the side, he sometimes looks to see where they have gone. Credit this item also if the child has passed this stage.

( ) 6. Aligns two or more bricks.
Score this item if the child can place cubes or bricks in rows.

Contd./

( ) 7. Can kick a ball without falling.
The child can kick a football or large rubber ball and maintain his balance (accuracy of direction is not necessary at this stage).

( ) 8. Throws ball intentionally without falling.
The child can stand and throw a ball without losing his balance. The accuracy of the throw is not important.

( ) 9. Picks up an object without falling.
The child, when standing, can bend over and pick up an object without falling or sitting down.

( ) 10. Can jump with both feet.
The child can jump up and down in the same place keeping his feet together and landing on his toes and flexing his knees while he does so.

( ) 11. Opens doors.
Score this point if the child can open a door by turning a knob or handle and pulling or pushing it open.

( ) 12. Seats himself at table.
This point is credited if the child is able to sit down in a chair and pull himself up to a table. Chair and table must be of appropriate size.

( ) 13. Takes lid off and puts it back on a box.
This refers to an ordinary cardboard box on which the top overlaps the sides to some extent.

( ) 14. Jumps with both feet off bottom step without requiring support.
To score on this item the child must keep both feet together and must not use the handrail.

( ) 15. Stands on one foot for short periods.
The child can stand for at least 5 seconds on one foot. He may wobble a bit but must not lose his balance.

( ) 16. Can stand on 'tip-toe' for at least 10 seconds on at least 3 out of 5 trials. Score this item even if child has to do some wriggling to maintain balance.

( ) 17. Can skip on both feet.
Using an ordinary skipping rope the child can turn the rope himself and skip on both feet not less than three times in succession at least once in 10 trials.

Contd./

( ) 18. Uses playground apparatus in a fairly safe and assured manner (swings, see-saw, etc.).
The point should be credited if the child:
(a) Is neither timid nor over-confident in his play with the above apparatus.
(b) Can generally be left to play on the playground without constant supervision and without accidents, <u>and</u>
(c) Can apply his physical agility to keep the apparatus under control eg. slow down when the swing is too high.

( ) 19. Can balance on 'tip-toe' while bending forward.
The child can, on at least 3 out of 5 trials, stand on tip-toe while bending forward (a) with both feet together, (b) with arms behind his back, and (c) without trying to regain balance by shifting from his place or sinking back on his heels.

( ) 20. Can balance on 'tip-toe' in crouched position.
The child should go down in a crouched position and balance on tip-toe for 10 seconds whilst stretching out his arms to keep his balance. Give 3 trials.

MANY THANKS FOR YOUR HELP

APPENDIX 5: Verbal Imitation Test

(Kiernan and Jones, 1982)

"Say ...." (give the child two trials per item)

A.		B	
	1. b as in boy		1. bang
	2. m as in man		2. cat
	3. d as in dog		3. dog
	4. n as in no		4. good
	5. p as in pipe		5. hoop
	6. s as in see		6. mouse
	7. f as in fat		7. no
	8. g as in go		8. pie
	9. k as in cat		9. saw
	10. h as in hat		10. teeth
	11. t as in toy		11. watch
	12. w as in way		12. mother

APPENDIX 6: Scoring Criteria for the Test of Expression of Gesture

(Number of points awarded is indicated in brackets)

Objects:

Sock	(1)	Touching shoe or foot
	(2)	Miming putting sock on foot
Ball	(1)	Simple throwing movement/mimes shape of ball
	(2)	Accurate throwing and/or catching movements, or several bouncing movements
Spoon	(1)	Momentary vertical raising of the hand in the air, or touching mouth, or making chewing movements with the mouth
	(2)	Movement suggesting holding a spoon and bringing it to the mouth
Brush	(1)	Single movement of hand near or on the head
	(2)	Repeated brushing movements on or near the head
Cup	(1)	Momentary vertical raising of hand in the air, or touching mouth
	(2)	Raising hand to the mouth and moving head or mouth appropriately in relation to it
Car	(1)	Movement suggesting pushing a toy car, or making'car related' sounds
	(2)	Repeated movements suggesting pushing a toy car back and forth, or miming driving motions (turning the steering wheel). 'Car related' sounds may accompany the above but are not essential for scoring

Pictures:

Pencil	(1)	Miming holding a pencil, or making one imaginary stroke with pencil
	(2)	Miming holding a pencil and drawing several imaginary strokes
Comb	(1)	Momentary vertical raising of hand near or on head
	(2)	Repeated combing movements on or near head
Knife	(1)	Momentary vertical raising of the hand in the air, or touching mouth, or making chewing movements with the mouth.
	(2)	Repeated imaginary cutting strokes
Broom	(1)	Pointing to the floor
	(2)	Repeated brushing movements directed at the floor
Spade	(1)	Pointing to the garden (eg. through window) or to the floor
	(2)	Miming digging movements directed at the floor

Words:

Laughing	(1)	Mouth open wide, or smiling facial expression
	(2)	Two or more of the following: mouth open wide, jerking movements of body or mouth, laughing sounds
Washing	(1)	Indicating one or more parts of the body
	(2)	Repeated rubbing of hands, face or other parts of the body
Sleeping	(1)	Pointing to eyes, or closing eyes, or yawning, or reclining movement of head or body
	(2)	Two or more of above
Eating	(1)	Momentary raising of hand in the air, or pointing to mouth
	(2)	Repeated chewing movements
Crying	(1)	Puckering eyes or mouth, or pointing to eyes, or making crying sounds
	(2)	Two or more of above

APPENDIX 7: Calculation of Mean Length of Utterance in Morphemes (Brown, 1973)

1. An utterance is defined as any remark which is marked off from preceeding and following remarks by pauses, or which, when written, can be separated from other remarks by full stops.
2. All exact repetitions of utterances are counted. Stuttering is marked as repeated efforts at a single word; the word is counted once in the most complete form produced. Where a word is repeated for emphasis, each occurrence is counted.
3. Fillers eg. 'mm', 'oh' are excluded. 'No, 'yeh', 'hi', are counted.
4. Compound words ('see-saw'. 'easter egg'), proper names and ritualized duplications ('night-night') count as single words.
5. All irregular past tenses ('got', 'went') count as single morphemes.
6. All diminutives count as single morphemes.
7. All auxiliaries are calculated as separate morphemes. Catenatives ('wanna', 'gonna') count as single morphemes.
8. All inflections (possessive, plural, regular tense endings etc.) count as separate morphemes.
9. Only fully transcribed utterances are used. Utterances in which one or more words are incomprehensible are excluded from the count.
10. MLU is computed by dividing the total number of morphemes in the sample by the total number of utterances counted.

APPENDIX 8: The LARSP Assessment Chart

(Crystal, Fletcher and Garman, 1976)

A	Unanalysed			Problematic		
	1 Unintelligible	2 Symbolic Noise	3 Deviant	1 Incomplete	2 Ambiguous	3 Stereotypes

B Responses			Normal Response						Abnormal		
			Major								
			Elliptical								
Stimulus Type	Totals	Repetitions	1	2	3+	Reduced	Full	Minor	Structural	Ø	Problems
Questions											
Others											
C Spontaneous											

D Reactions		General	Structural	Ø	Other	Problems

Stage I (0;9–1;6)

Minor	Responses		Vocatives	Other	Problems
Major	*Comm.*	*Quest.*	*Statement*		
	'V'	'Q'	'V' 'N'	Other	Problems

	Conn.	Clause				Phrase		Word
Stage II (1;6–2;0)		VX	QX	SV	AX	DN	VV	-ing
				SO	VO	Adj N	V part	pl
				SC	VC	NN	Int X	-ed
				Neg X	Other	PrN	Other	
Stage III (2;0–2;6)		X + S:NP	X + V:VP	X + C:NP		X + O:NP	X + A:AP	-en
		VXY	QXY	SVC	VCA	D Adj N	Cop	3s
		let XY		SVO	VOA	Adj Adj N	Aux^{M}_{O}	gen
			VS(X)	SVA	VO_dO_i	Pr DN		
		do XY		Neg XY	Other	$Pron^{P}_{O}$	Other	
Stage IV (2;6–3;0)		XY + S:NP	XY + V:VP	XY + C:NP		XY + O:NP	XY + A:AP	n't
		+ S	QVS	SVOA	AAXY	NP Pr NP	Neg V	'cop
			QXY +	SVCA	Other	Pr D Adj N	Neg X	'aux
		VXY +	VS(X+)	SVO_dO_i		cX	2 Aux	
			tag	SVOC		XcX	Other	
Stage V (3;0–3;6)	*and*	Coord.	Coord.	Coord 1	1 +	Postmod. clause 1	1 +	-est
	c	Other	Other	Subord. A 1	1 +			-er
	s			S C	O			
	Other			Comparative		Postmod. phrase 1 +		-ly

Stage VI (3;6–4;6)

(+)			(−)							
NP	VP	Clause	Conn.	Clause	Phrase				Word	
					NP			VP	N	V
				Element						
Initiator	Complex	Passive	*and*	Ø	D	Pr	Pron^P	Aux^M Aux^O Cop	*irreg*	
Coord		Complement	c	=	DØ	PrØ				
		how *what*	s	Concord	D =	Pr =		Ø	*reg*	
Other								Ambiguous		

Stage VII (4;6+)

Discourse		*Syntactic Comprehension*
A Connectivity	*it*	
Comment Clause	*there*	*Style*
Emphatic Order	Other	

Total No. Sentences	Mean No. Sentences Per Turn	Mean Sentence Length

APPENDIX 9: Semantic Relations for Classification of Multi-term Sign, Symbol and Spoken Utterances

(Brown, 1973; MacDonald, 1978)

Guidelines for classification:

1. The categories are defined semantically rather than grammatically. Therefore a child may use incorrect grammatical markings, such as word order, to express a relation. Yet as long as its meaning is clear from the context in which it is uttered, the utterance is appropriately classified.
2. The notion of category can imply more than a single word. For example, the category of Location can be a prepositional phrase (eg. "in the garden").
3. Words of any grammatical class may function as several semantic units. For example, the word "up" may be an Action, Object or Location, as in "up baby", "want up" and "hold up" respectively. Only the full environmental context will determine the semantic nature of the utterance.
4. The use of "here" and "there" in the final position, with nonlinguistic context supporting the notion of location, is interpreted as conveying a Location (eg. "box here", as the child moves a box to a new location).
5. The prepositions "in", "on", "off", "out" etc., when used in the context of intended action, are interpreted as conveying an Action (eg. "shoe on", as the child puts on shoes).
6. Interrogatives and imperatives are, where possible, categorized as one of the basic semantic relations (eg. "my ball?" is classified as modifier - head). However, utterances like "what that?" are considered as 'other constructions', since they cannot be classified as one of the basic relational meanings listed.
7. Items such as articles and auxiliary verbs are not considered to express a semantic function. Thus "boy throws ball" and "the boy throws the ball" are both considered as three-term semantic relations.
8. Single semantic units (eg. "garden", "in the garden") are not analyzed.

A. Two – term Semantic Relations:

Category	Definition
Agent - Action:	An utterance which expresses an action being made by a person or thing. The agent may be someone or something which is perceived as having its own motivating force and causing an action or process. Most agents are animate, but a few are not. Actions involve perceived movement. Particles from separable verbs may also be used as if they name actions (eg. "boy off"). Experiencer + State is another form of the Agent + Action relation and is included in this category. The Experiencer is mentally disposed in some way or is having a given experience. Examples: I blow, baby hurt, man love, John funny, I want, boy go.
Action - Object:	A statement that an action is made on a direct object. An object is someone or something either undergoing a change of state or simply receiving the force of an action. Examples: want it, see sock, open door, hug John.

Agent - Object: This relation refers to someone or something in direct interaction with another person or thing. Examples: Eve lunch, Daddy sandwich, me hat, he car.

Modifier - Head: This relation refers to someone or something specified with a specific attribute. The three major classes of modifiers are possession, recurrence and attribution. Examples: my car, Daddy ('s) chair, more read, another cake, big boy, party hat, again television, red cup, two glove.

Negation - X: This relation refers to a referent which is being negated with a word implying negation. Examples: no outside, no more juice, all gone book, drink gone, dog no.

Action-Location: Where a word is used to indicate where an action takes place. The locative is typically expressed with a noun or adverb. Examples: go away, push on, go potty, stand up, give here, walk street.

Agent/Object-Location: Where a word is used indicating where something is located. Examples: Jane up, Daddy away, John here, baby table (is sitting at ...), sweater chair (is on ...).

Introducer - X: When children take notice of part of the environment, they often express this attention with an introducer accompanying the referent being noticed. Any word that serves a naming or noticing function may be the introducer (eg. this, that, hi, it, the, and). The word for X may be of any grammatical class that is the object of notice. It is usually a noun, but can be a word for quantity or quality. Examples: here more, that button, it's book, this first.

Other Constructions: Semantic relations which are not included above. Including Instrumental (eg. sweep broom); Benefactive (eg. buy (for) John); Conjunctions (in the sense of naming present objects eg. Tom, John); Classificatory (eg. Daddy man); Question (eg. what that).

Unclassifiable: Utterances that are semantically uninterpretable. For some of these one cannot offer any reasonable hypothesis whatsoever. For others one can offer two or more, but there is no way of choosing among them.

B. Three-term Semantic Relations:

Agent - Action - Object (eg. he ride horse).
Experiencer - State - Source (eg. I want milk, I feel good).
Introducer - Modifier - Object (eg. it my car, see Eve car).
Agent - Action - Location (eg. truck go there).
Action - Modifier - Head (eg. rock baby doll).
Other Constructions (eg. Agent + Object + Location; Agent + Action + Temporal; Action + Location + Temporal; Action + Location + Instrument. Also noun phrase expansion within two term relations).

Unclassifiable.

C. Four - term Semantic Relations:

Agent - Action - Object - Locative (eg. he ride horse in field).
Other Constructions (including five-term and longer utterances).
Unclassifiable.

APPENDIX 10: Conversational Acts - Categories, Definitions and Examples (Dore 1977)

1. Requests for information, action or acknowledgement

Yes/no Questions seeking true-false judgements about propositions (eg. Is she playing?)

Wh-Questions seeking factual information (eg. Where is he going? What happened?)

Action Requests seeking that the listener do/stop doing something (eg. Let's look at this)

Permission Requests soliciting the listener to grant permission for the speaker to do something (eg. Can I go?)

Rhetorical Questions seeking acknowledgement from the listener to allow the speaker to continue (eg. You know what?)

2. Responses to requests

Yes/no Answers supplying true-false judgements (eg. No, he's not going)

Wh-Answers supplying solicited factual information (eg. What did you see? Pictures)

Compliances verbally expressing acceptance, denial or acknowledgement of a prior action or permission request (eg. Okay. Yes I'll do it)

Qualifications supplying unexpected information in response to the soliciting question (eg. But I didn't do it)

Repetitions repeating part of prior utterance

3. Descriptions of verifiable past and present facts

Identifications labelling objects, events etc. (eg. That's a doll. John is a boy)

Descriptions of Events, Actions, Processes (eg. I'm drawing a house)

Descriptions of Locations or Directions (eg. Here is the doll. I put it in the box)

Descriptions of Properties, Traits or Conditions (eg. That's a bear with a wheel)

Description of Times (eg. I ran yesterday)

4. Statements of facts, rules, attitudes, feelings and beliefs

Rules express rules, procedures, definitions, facts etc. (eg. You can't ride. You have to share)

Evaluations express personal attitudes, judgements etc. (eg. That's right. Good)

Internal Reports express emotions, sensations and mental events including intents to perform future acts (eg. I'm tired. I don't think it's clean)

Attributions report beliefs about another's internal state (eg. He wants to go)

Explanations express reasons, causes and predictions (eg. It will fall)

5. Organization Devices regulate contact and conversation

Boundary Markers indicate openings, closings and other significant points in the conversation (eg. Hi. Bye. Okay)

Calls solicit attention (eg. Bob. Hey!)

Speaker Selections explicitly label the speaker of the next turn (eg. John. You)

Politeness Markers indicate ostensible politeness (eg. Thanks. Please)

Accompaniments maintain verbal contact, typically conveying information redundant with respect to context (eg. Here you are)

6. Performatives accomplish facts by being said

    Protests register complaints about the listener's behaviour (eg. Stop)
    Jokes display nonbelief towards a proposition for a humorous effect (eg. We throwed soup on the ceiling)
    Claims establish rights by being said (eg. That's mine)
    Warnings alert the listener of impending harm (eg. Watch out)
    Teases annoy, taunt or playfully provoke the listener (eg. You can't do it)

7. Uninterpretable

    Unintelligible, incomplete or ambiguous utterances, where there is insufficient or no information to make a decision

8. Other

    Utterances which are intelligible but do not fit into any of the above categories

APPENDIX 11: Teacher Questionnaire on Child's Communicative Abilities

Child's name: ______________________ Date: ______________________

School: ______________________ Filled in by: ______________

(Teacher/Speech Therapist)

CHILD'S COMMUNICATIVE ABILITIES

Some of the items below are scored as 'usually, occasionally, never'. These terms are defined as follows:

Usually: This is the child's typical pattern of behaviour. If the behaviour depends on an appropriate context then you would expect the child to perform this way in the situation described by the item.

Occasionally: This is not typical of the child's behaviour but he has done this on at least one or two occasions.

Never: The child has never been known to behave this way in the situation described by the item.

1. Locomotion Ability (tick the statement which is nearest to correct)
   - ( ) 1. Child walks alone and manages a chair.
   - ( ) 2. Partially independent and can move around, walking with help of adult or walking aid, or crawling, or moving himself around in wheelchair (electric or non-electric).
   - ( ) 3. Totally dependent and confined to one place unless moved by others.

2. Head Control (tick the statement which is nearest to correct)
   - ( ) 1. When sitting, or held in the upright position, child can hold his head up and turn it either way with full control.
   - ( ) 2. When sitting, or held in the upright position, child can hold his head up for a short time - 5 seconds or more.
   - ( ) 3. When lying down he is able to turn his head from side to side.
   - ( ) 4. When lying down he is unable to turn his head.

3. Sitting (tick the statement which is nearest to correct)
   - ( ) 1. Child can sit firmly and safely on a dining room chair or on floor and eat or play in this position.
   - ( ) 2. Can sit in a dining room chair or on floor but it is necessary to place some support (eg. cushions) around him or be close at hand or he might tumble over.
   - ( ) 3. All his weight has to be taken by an adult holding him or by a harness or straps; he hasn't the strength or necessary muscular control to sit without such help.

4. Standing (tick the statement which is nearest to correct)
   ( ) 1. Can stand firmly and steadily without support.
   ( ) 2. Can stand without support - but is rather unsteady.
   ( ) 3. Can stand only with some support - holds on to furniture, leans against walls etc.
   ( ) 4. Can stand only with the support of a walker, standing frame or adult taking some of his weight.
   ( ) 5. Is unable to stand however supported.

5. (a). In your view, to what extent is impairment of the speech musculature involved in the child's speech difficulties? (Please tick the statement which is nearest to correct).
   ( ) Very severe involvement of the speech musculature. The child has no voluntary movement at all of the lips, tongue, jaw and hard and soft palate.
   ( ) Severe involvement of the speech musculature. The child has limited voluntary movement of some of the speech muscles.
   ( ) Moderate involvement of the speech musculature. The child has some voluntary control of most of the speech muscles but in an impaired fashion.
   ( ) Slight or no impairment of the speech musculature.

   (b). Control of the speech Musculature (For each statement place a tick in the column which best describes this child)

	Yes, with no difficulty	Yes, but with some difficulty	No or only with the greatest difficulty
1. Can the child eat successfully from a spoon or fork using his lips to take food off the spoon into his mouth			
2. Does he chew normally, with apparent control of the jaws and lips (i.e. chews with lips closed, moving his jaw round as well as up and down).			
3. Does he swallow normally, with apparent control of tongue (i.e. swallows with lips closed so that food does not escape from mouth, and without choking).			

CONT./....

Item 5.(b) Cont.

	Yes, with no difficulty	Yes, but with some difficulty	No or only with the greatest difficulty
4. Does he have normal breathing (i.e. is without motor spasticity).			
5. Is he able to blow a tissue or similar material through his lips			
6. Is he able to suck through his lips from a straw or bottle.			
7. Can he stick his tongue out of his mouth when asked or shown how OR alternatively use his tongue to lick crumbs off his lips or to lick a lolly etc.			

6. Development of Sounds

Although the child may no longer display the behaviours described below, it is important to determine whether he is capable of making these responses. If the child does not often do these things, but can do them if required, credit the child with 'Yes'.

	Usually	Occasionally	Never
1. Can make throaty noises or grunts or moans			
2. Can make open vowel sounds eg. aaa, eee, ooo			
3. Can make mmm or sss sounds			
4. Can make a consonant sound (which may be combined with a vowel, eg. buh, moh)			
5. Can repeat the same syllable two or three times (eg. ma, ma, ma)			
6. Can combine 2 different sounds in vocal play eg. da-ba, ee-aa			
7. Can babble with sounds close to normal speech sounds and possibly with a recognisable word or two.			

7. (a) Does the child have (place a tick where appropriate)

( ) 3 or less intelligible words ( ) 4 to 10 intelligible words

( ) 10 to 30 intelligible words ( ) more than 30 intelligible words

7. (b) Articulation

(Please tick one of the following)

( ) The words that the child uses are understood by anybody - clear enunciation of most sounds.

( ) The words the child uses are understood better by the people who work closely with him than by others because of difficulty with some sounds.

( ) The words the child uses are understood almost only by those who work closely with him because of difficulty with most sounds.

( ) The child's speech is not understood most of the time by the people who work closely with him.

CHILD'S CURRENT COMMUNICATIVE ABILITIES

(Consider the child's present communication skills, i.e. over the past two weeks)

8. Does the child nod or make some other consistent gesture/facial expression to indicate 'yes"

( ) usually ( ) occasionally ( ) never

9. Does the child shake his head or make some other consistent gesture to indicate 'no'

( ) usually ( ) occasionally ( ) never

10. 'Desire' to communicate

At present, to what extent does the child use a means of communication (such as words, vocalisations, gesture, touching, Makaton signs, indicating pictures/symbols) to do the following: (Please tick appropriate column)

	Usually	Occasionally	Never
1. Get an adult's attention when near the adult			
2. Get an adult's attention when away from adult			
3. In order to indicate to adult or child that he wants a particular object or activity (eg. toy, drink)			
4. In order to indicate to adult that he wants or needs to go somewhere (eg. toilet, playroom)			

Item 10. Cont.

	Usually	Occasionally	Never
5. In order to indicate to adult a more complex need or desire, eg. he wants adult to repair his toy			
6. Indicate or reach out to be lifted or hugged			
7. Indicate hello and goodbye without prompting			
8. Refuse to take an object or reject an advance by another person when he does not want interference (eg. in response to adult trying to brush his hair)			
9. Simply to draw someone's attention to the presence of something, equivalent to saying "Look, there it is"			
10. Indicate his objection or a conciliatory response when he is told off			
11. To indicate the answer to such questions as "What are you doing" and "What happened"			
12. To have a 'conversation' or 'interaction' with an adult or child			
13. Watches other children/adults with interest			
14. Initiates eye contact with other people when they are near for a short time (2-3 mins)			
15. To communicate or report spontaneously about events and things he has done (eg. went on a picnic)			

11. To what extent does the child now use the following means of communication to express his needs and wants (Please tick appropriate column)

	Reliable Use	Occasional Use	Never Used
1. Smile and facial expression			
2. Expressive noises eg. babble			
3. Eye pointing to things he wants			

CONT./.....

Item 11 Cont.

	Reliable Use	Occasional Use	Never Used
4. Hand/arm pointing to things he wants			
5. Indicating 'yes' and 'no'			
6. Eye pointing to pictures of things he wants			
7. Hand/arm pointing to pictures of things he wants			
8. Uses informal gestures, or mimes his wants and needs			
9. Uees Makaton sign language			
10. Uses a Bliss symbol communication chart			
11. Uses single words			
12. Uses 2 word phrases (eg. "want sweets")			
13. Uses sentences			

12. Which of the following modes of communication does the child now use to express the needs and desires listed below: (Please write down the mode of communication used, next to each item. If the child uses more than one mode, eg. gesture plus sign, please note all modes used to express the particular needs). Select mode(s) of communication from the following list: Words, Vocalisations, Eye pointing, Hand pointing, Facial expression, Gesture/mime, Makaton signing, Pictures/Blissymbols, Does not communicate.

Mode(s) Used

1. How does the child communicate that he wants food or drink ________
2. How does the child communicate that he wants to go to the toilet __
3. How does the child communicate that he has a pain ________________
4. How does the child communicate that he wants objects eg. toys _____
5. How does the child indicate that he wants something outside the classroom ____
6. How does the child tell you that he does not want something _______
7. If the child wants to draw your attention to things simply to indicate their presence, how does he do this ____________________
8. How does the child communicate something that has happened or that he has done eg. gone on a picnic ____________________________

13. Does the child use symbols/signs - (Please tick appropriate column)

	Usually	Occasionally	Never
1. When directed to find a symbol/ make a sign			
2. In answer to a question			
3. Spontaneously to ask for objects			
4. Spontaneously to indicate a need (eg toilet)			
5. Spontaneously in conversation with adults			
6. To communicate with other children			
7. Other (Please specify)______ ______			

14. At present, how do you and other adults usually let the child know something, ask him questions, instruct him to do things etc. (Please tick one or more of the following)

( ) use simple pointing

( ) use one to five simple gestures

( ) use more than five simple gestures

( ) use accurate miming of concepts to be communicated

( ) use speech

( ) use Bliss/Makaton

( ) other. Please describe: ______

15. To what extent does the child now attempt to communicate with the following people:

	Usually	Occasionally	Never
1. Class teacher			
2. Other classroom aides (nursery assistants, care staff etc.)			
3. Speech therapist			
4. Other teachers and staff in school			
5. One to three other children in class			
6. More than three other children in class			
7. Peers on the playground and after school			
8. Anyone else (eg. visitors to school, doctor, shop assistants). Please specify: ______ ______			

16. To what extent does the child now attempt to communicate, using Bliss/Makaton, with the following people:

	Usually	Occasionally	Never
1. Class teacher			
2. Other classroom aides (nursery assistants, care staff etc.)			
3. Speech therapist			
4. Other teachers and staff in school			
5. One to three other children in class			
6. More than three other children in class			
7. Peers on the playground and after school			

8. Anyone else (eg. visitors to school, doctor, shop assistants). Please specify ______________________

____

____

17. Situations in which the child uses signs/symbols (Please tick appropriate statement(s))

( ) Sign or symbol sessions only

( ) Sign or symbol sessions plus sometimes at other periods in class too

( ) All work in class, including special sessions if held

( ) School activities outside the classroom eg. singing, assembly, playtime etc. Please specify: ______________________

If the child is in a residential school, is Bliss/Makaton used with the care staff:

( ) Usually ( ) Occasionally ( ) Never

18. To what extent are the child's attempts at communication now understood by the people around him (For each column please tick appropriate row).

	Class Teacher and aides	Other staff	Peers in class	Strangers
1. Does not communicate				
2. Is not understood at all				
3. Can make his wants known only occasionally				
4. Can usually make his wants known				

Item 18 contd.

	Class Teacher and aides	Other Staff	Peers in class	Strangers
5. Can occasionally communicate his experiences and thoughts so as to be understood				
6. Can usually communicate his experiences and thoughts so as to be understood				

19. If the child is using Blissymbols: (Please tick which appropriate)

(a) Does he now indicate the symbols with:

( ) a fine hand movement eg. a single finger ( ) a gross hand movement or fist

( ) eye pointing ( ) head pointer

( ) some other means eg. electronic. Please describe ______________

____

(b) Does he use any of the following strategies:

( ) "combine" symbol ( ) "making descriptive" symbol

( ) "opposite" symbol ( ) "make action" symbol

( ) any other strategies - please specify ______________________

20. If the child is using Makaton, does he now:

( ) make the signs precisely and exactly

( ) approximate the signs, but these are easily identifiable by others

( ) make very vague movements in signing attempts, which are difficult for others to identify

21. Is the child learning to read yet?

( ) YES ( ) NO

22. In total, how many hours of sign/symbol teaching does the child now receive per week: ________________ hours.

23. At present, when you communicate with the child who is using Bliss/Makaton, do you mostly use:

( ) speech only

( ) speech, and point to symbols/make the signs for some of the words

( ) speech, and sign/point to all of the words for which the child has signs/symbols.

24. Teaching signs/symbols

(a) How are you now proceeding with teaching this child sign/symbol use? (eg. use picture cards/concrete objects linked to signs/symbols, physical prompting of signing or of pointing to symbols etc.). Please describe briefly:

____

____

____

(b) Do you try to foster English syntax in the child's production of Blissymbols or Makaton signs? ( ) YES ( ) NO

If yes, how do you do this? ______________________

____

What are your feelings about this issue? ______________

____

25. In addition to being taught Bliss/Makaton, does the child also receive speech therapy sessions where emphasis is placed solely or largely on the comprehension and development of speech:

( ) YES ( ) NO

If yes, how many hours per week? ________

What kind of therapy? (articulation, comprehension etc.) ____

____

26. As far as you know, what is the present attitude of the parents to the child's use of Bliss/Makaton:

( ) Fully in favour and supportive ( ) Give some support

( ) Indifferent or uncertain ( ) Not very favourable

( ) Opposed to it

27. Are there any other comments you would like to make about the child or the system he/she is using: ______________________

____

____

THANK YOU VERY MUCH FOR YOUR HELP

APPENDIX 12: Parent Questionnaire on Child's Communicative Abilities

Child's name: ________________ Date: ____________________________

Filled in by: ____________________

Relationship to child: ____________

In some of the items below you are asked whether a particular behaviour of the child's occurs 'usually', 'occasionally' or 'never'. These terms are defined as follows:

Usually: This is the child's typical pattern of behaviour. If the behaviour depends on an appropriate context then you would expect the child to perform this way in the situation described by the item.

Occasionally: This is not typical of the child's behaviour but he has done this on at least one or two occasions.

Never: The child has never been known to behave this way in the situation described by the item.

1. Is your child using speech?

   ( ) YES ( ) NO

   If yes, when did he/she say his/her first 'proper' word?

   ( ) during the past 6 months ( ) more than 6 months ago

   Is your child joining words together i.e. using phrases and/or sentences?

   ( ) YES ( ) NO

   If yes, when did he/she start joining words together?

   ( ) during the past 6 months ( ) more than 6 months ago

---

2. Does/did your child play imitation games such as 'peek-a-boo', clapping hands, waving 'bye-bye','pat-a-cake' etc.? (Please tick which appropriate)

   ( ) Frequently ( ) Occasionally ( ) Never

   Does/did your child try as far as possible to imitate his mother's or other people's actions in dusting, hoovering, making tea (with toys) etc.

   ( ) Frequently ( ) Occasionally ( ) Never

---

3. Is your child on any anticonvulsant drugs?

   ( ) YES ( ) NO

   If yes, which one(s): ______________________________

THE CHILD'S CURRENT COMMUNICATIVE ABILITIES

(Consider the child's present communication skills, i.e. over the past few weeks)

4. Does your child nod or have some other consistent way of indicating 'yes'?
   ( ) usually ( ) occasionally ( ) never

---

5. Does your child shake his head or have some other consistent way of indicating 'No'?
   ( ) usually ( ) occasionally ( ) never

---

6. At present, to what extent does your child use means of communication (such as sounds, gestures, touching, pointing, Makaton signs, indicating pictures/Bliss symbols, words) to do the following: (Please tick appropriate column)

	Usually	Occasionally	Never
1. Get an adult's attention when near the adult			
2. Get an adult's attention when away from adult			
3. In order to indicate to adult or child that he wants a particular object or activity (eg. toy,drink)			
4. In order to indicate to adult that he wants or needs to go somewhere (eg. toilet, outside to play)			
5. In order to indicate to adult a more complex need or desire, eg. he wants adult to repair his toy			
6. To indicate or reach out to be lifted or hugged			
7. To indicate hello and goodbye without prompting			
8. Refuse to take an object or reject an advance by another person when he does not want interference (eg. in response to an adult trying to brush his hair)			
9. Simply to draw someone's attention to the presence of something, equivalent to saying "look, there it is".			

Item 6 Contd.

	Usually	Occasionally	Never
10. To indicate his objection, or an apology, when he is told off			
11. To indicate the answer to such questions as "What are you doing" and "What happened"			
12. To have a 'conversation' or 'interaction' with an adult or child			
13. Watches other children/adults with interest			
14. Initiates eye-contact with other people when they are near for a short time (2-3 minutes)			
15. To communicate or report spontaneously about events and things he has done (eg. went on a school outing)			

7. To what extent does the child now use the following means of communication to express his needs and wants (Please tick appropriate column)

	Reliable Use	Occasional Use	Never Used
1. Smiling and facial expressions			
2. Expressive noises eg. babble, sounds			
3. Eye pointing to things he wants			
4. Hand/arm pointing to things he wants			
5. Indicating 'yes' and'no'			
6. Eye pointing to pictures of things he wants			
7. Hand/arm pointing to pictures of things he wants			
8. Uses informal gestures, or mimes his wants and needs			
9. Uses Makaton sign language			
10.Uses a Blissymbol communication chart			
11.Uses single words			
12.Uses 2 word phrases (eg. "want sweets")			
13.Uses sentences			

8. Which of the following modes of communication does the child now use to express the needs and desires listed below: (Please write down the mode of communication used, next to each item. If the child uses more than one mode, eg. gesture plus sign, please note all modes used to express the particular needs). Select mode(s) of communication from the following list: Words, Sounds, Facial expressions, Eye pointing, Hand pointing, Informal gesture/mime, Makaton signing, Pictures/ Blissymbols, Does not communicate.

   1. How does the child communicate that he/she wants food or drink?

      ____

   2. How does the child communicate that he/she wants to go to the toilet?

      ____

   3. How does the child communicate that he/she has a pain?

      ____

   4. How does the child communicate that he/she wants objects eg. toys?

      ____

   5. How does the child indicate that he/she wants something outside the room?______________________________

   6. How does the child tell you that he/she does not want something?

      ____

   7. If the child wants to draw your attention to things simply to indicate their presence how does he/she do this?

      ____

   8. How does the child communicate something to you that has happened or that he/she has done eg. gone on a picnic?

____

9. Does the child use Bliss/Makaton - (Please tick appropriate column)

	Usually	Occasionally	Never
1. When directed to find a symbol/ make a sign			
2. In answer to a question			
3. Spontaneously to ask for objects			
4. Spontaneously to indicate a need (eg. toilet, drink)			
5. Spontaneously in conversation with adults			
6. To communicate with other children			

____

10. At present, how do you and other adults usually let the child know something, ask him/her questions, instruct him/her to do things etc. (Please tick one or more of the following).

( ) use simple pointing only
( ) use one to five simple gestures
( ) use more than five simple gestures
( ) use accurate miming of concepts to be communicated
( ) use speech
( ) use Bliss/Makaton
( ) other. Please describe: ______________________

11. To what extent does the child now attempt to communicate with the following people:

	Usually	Occasionally	Never
1. Parents			
2. Brothers and sisters			
3. Extended family (grandparents, aunts, etc.)			
4. Neighbours and parents' friends			
5. Other children around his/her age			
6. Anyone else (eg. shop assistant, doctor, other strangers). Please specify ________________ ________________ ________________			

12. To what extent does the child now attempt to communicate, using Bliss/Makaton, with the following people:

	Usually	Occasionally	Never
1. Parents			
2. Brothers and sisters			
3. Extended family (grandparents, aunts etc.)			
4. Neighbours and parents' friends			
5. Other children around his/her age			
6. Anyone else (eg. shop assistant, doctor, other strangers. Please specify ________________ ________________			

13. To what extent are the child's attempts at communication now understood by the people around him (for each column please tick appropriate row):

	Parents	Brothers & sisters	Aunts Uncles etc.	Adult Neighbours	Children of same age	Strangers
1. Does not communicate						
2. Not understood at all						
3. Can make his/her wants understood only occasionally						
4. Can usually make his/her wants known						
5. Can occasionally communicate his/her experiences and thoughts so as to be understood						
6. Can usually communicate his/her experiences and thoughts so as to be understood						

14. What is your present feeling about the child's use of Bliss/Makaton?

( ) Fully in favour ( ) Some support for it ( ) Not sure

( ) Not in favour ( ) Very much opposed to it

Could you explain why: ______________________________

____

15. Do you see any change in your child's ability to communicate over the past 6 months?

( ) No change ( ) Deterioration

( ) Slight improvement ( ) Somewhat improved ( ) Marked improvement

16. When you 'speak' to the child, do you mostly use

( ) Speech only

( ) speech, and pointing to Blissymbols/making signs for some of the words

( ) speech, and signing/pointing to all the words for which the child has signs/symbols

---

17. Are there any other aspects of your child's communication difficulties and/or use of Bliss/Makaton which you feel are relevant and which have not been covered above?

____

____

____

____

THANK YOU VERY MUCH FOR YOUR HELP

APPENDIX 13: The Needleman Questionnaire

(Needleman, Gunnoe, Leviton et al., 1979)

Below are eleven questions concerning behaviour often shown by children in school. Please answer YES or NO to each question by placing a cross in the appropriate column.

	Yes	No
1. Is the child easily distracted during his/her work?		
2. Can he/she persist with a task for a reasonable amount of time?		
3. Can the child work independently and complete assigned tasks with minimal assistance?		
4. Is his/her approach to tasks disorganised (constantly misplacing pencils, books etc.) ?		
5. Do you consider the child hyperactive?		
6. Is he/she over-excitable and impulsive?		
7. Is he/she easily frustrated by difficulties?		
8. Is he/she a daydreamer?		
9. Can the child follow simple directions?		
10. Can he/she follow a sequence of directions?		
11. In general, is the child functioning as well in class as comparable children of his/her own age and degree of handicap?		

APPENDIX 14: Observation of Activity and Attending Behaviour - Definition of Categories

Gross Body Movements: motor movements involving change of posture (i.e. movement of the trunk or entire body, wriggling or stretching). 'Off-seat', walking and moving about in the room are included when these movements are inappropriate to the task. Involuntary movements which are part of the condition of cerebral palsy are NOT included.

Gaze Aversion: looking away from the task or teacher when this is not indicated by the nature of the task. In conversational situations looking aside is not scored.

Off Task: attention to stimuli other than the assigned work after initiation of appropriate task-relevant behaviour.

Irrelevant Vocalizations: any vocalizations (speech and non-speech sounds) such as singing, humming, whistling, tongue clicking or making odd noises, not related to the task.

Reaching Objects: taking or reaching for objects, or playing with objects, that are not offered or on free display.

Interference: a general measure of disruptiveness. Includes calling out, interruption of others during work, clowning, and aversive or unpleasant physical contact such as tugging or slapping. Includes clear intrusion into another's personal space, eg. grabbing a pen from another child.

APPENDIX 15: The Progress Assessment Charts - Self-help and Socialization Scales (Gunzburg, 1977)

Name of Child: ________________ Date: ____________________

Filled in by : ____________________

Relationship to Child : ____________________

Below is a list of self-help and social skills that are acquired by young children. Please place a tick next to those skills which the child has already acquired. Do not tick if the child has not yet acquired the skill or is unable to perform it because of his handicap.

Table Habits

( ) 1. Uses spoon (may spill some food)
This item is credited if food, suitably prepared, can be eaten by the child with a spoon, with no more than occasional assistance.

( ) 2. Drinks from a cup unaided without spilling, and holds it.
Allowance should be made for occasional spills, but the child should generally be able to pick up the cup, take what he wants to drink without spilling, and put the cup back down safely.

( ) 3. Eats unaided.
The food may be prepared and cut up in such a way that it can be eaten with a spoon, but when given the dish of food and the spoon, the child must be able to feed himself without help. Allowance should be made for occasional accidents and refusals.

( ) 4. Uses a fork without difficulty (food may be cut and prepared).
For this item the food may be cut and prepared beforehand, but the child must be able to use the fork properly where appropriate, rather than 'spooning' the food with the fork.

( ) 5. Capable of taking a drink by himself without help.
This is an extension of item 2 and requires the additional skills involved in obtaining a drink. This may be either from a tap or by pouring a drink from a jug. The child should be able to help himself entirely from the sources easily accessible to him.

( ) 6. Serves himself and eats without requiring much help.
Score this item if the child is able to eat at the table in the following manner:
(a) Uses a spoon and fork (not necessarily a knife) for eating pre-cut and prepared food.
(b) Waits his turn, does not demand to be served first.
(c) Helps himself with judgement, to vegetables, potatoes etc.
(d) Does not have frequent accidents at table, due to clumsiness or hastiness.
(e) Generally draws little attention to himself, though of course he may have to be helped from time to time

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( ) 7. Uses table knife for spreading butter, jam, etc.
This item requires no more than using the knife for spreading. Butter is often too hard and so is not always a fair test for this skill. It is quite sufficient to spread jam, honey etc. on toast or bread without making a mess.

( ) 8. Uses knife for cutting without much difficulty.
This refers to the ability to use a knife for cutting some foods to edible size, not necessarily including tough meat, meat on bones, etc.

( ) 9. Uses knife and fork correctly and without difficulty.
To credit this item the child must be able to hold cutlery firmly in the correct place, and to use them for correct purposes, i.e. cuts with knife, holds and picks up with fork.

Toilet

( ) 1. Uses pot/toilet chair when placed on it.
Score this item if the child uses the pot at least once a day. For the item to be credited it should be clear that the child knows what the pot is for. Score this item also if the child is already toilet trained.

( ) 2. Bowel movements are generally regular.
This item should be credited if it is possible to predict most of the time, when the bowel movement is due and the child should be put on the pot. Score this item also if the child is already toilet trained.

( ) 3. Has established some regularity during daytime, and waits a reasonable time before attended to.
Credit this point if the child has enough sphincter control that he can wait at least a few minutes before being put on the pot.

( ) 4. Indicates when wet/dirty.
Score this point if the child frequently gives some sign that he is wet or dirty, indicating that he knows something has to be done about it.

( ) 5. Bladder control during day but has to go quite often.
Score this point if the child can keep dry during the day if he is taken to the toilet frequently. At this stage, the initiative may be his own or his mother's or the teacher's etc., the point being that he does not wet himself as long as he is taken to the toilet fairly frequently. Credit this point also if the child is already toilet trained.

( ) 6. Toilet trained with infrequent accidents.
The child has generally obtained bowel control and neither wets nor dirties himself during the daytime, except for occasional accidents due to excitement etc. Bed-wetting at night is not considered here.

( ) 7. Asks to go to the toilet or goes by himself.
This is scored when the child is in the habit of drawing attention (by word or gesture) to his need to go to the toilet or goes without asking.

Contd./

Dressing

( ) 1. Co-operates passively when being dressed.
The child does not resist during dressing, but co-operates at least to the extent of stretching out his arm after his hand has been placed in the sleeve

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( ) 2. Holds out arms and feet when being dressed.
Credit this item if the child holds out his arms to have them put into the sleeves and holds out his feet for his socks or shoes.

( ) 3. Assists in getting dressed.
This is a step beyond simply co-operating by extending arms for sleeves and legs for shoes. To score on this item, the child must be able to do at least one of the following:
a) put his arm into a large armhole.
b) help pull up his pants, or
c) hand clothes to the person dressing him.

( ) 4. Pulls off socks.
The child frequently takes off his socks (or any other footwear) while undressing. He may do this either spontaneously or in response to a request.

( ) 5. Removes and puts on simple articles of clothing.
The child must be able to take off and put on at least one of the following: coat, jacket, pullover, cardigan or dress. At this stage it is not necessary for him to be able to manage buttons or zips.

( ) 6. Unbuttons large buttons which can be reached easily.

( ) 7. Fastens and adjusts his clothing.
The child can tackle three different types of fasteners reasonably well eg. buttons, buckles, press studs, zips etc. They should not be difficult to manage and should be easily accessible.

( ) 8. Undresses at night with little supervision and puts on night clothes.

( ) 9. Dresses in morning with little supervision.
Clothes may be laid out for the child, but he must be able to put them on and fasten them with little supervision (eg. checking up, reminders). At this stage he may have help with shoelaces and bows.

( ) 10. Puts on most ordinary articles of clothing.
The child should now be able to find his own clothes in a cupboard and put on underclothing, trousers, jacket, dress, socks and shoes, fasten them reasonably well and not look too untidy. He should need no supervision other than a final check for neatness. For this item he is not expected to manage shoelaces and bows.

Contd./

( ) 11. Ties shoelaces without help.

Socialization

( ) 1. Plays pat-a-cake.
Score this point if the child claps his hands in imitation or in response to verbal request or plays any similar game involving imitation. Credit the item also if the child has passed this stage.

( ) 2. Gets attention by making noises.
For this item the child must make noises other than crying to attract adult attention.

( ) 3. Wants adult approval for good behaviour.
Score this item if the child makes some attempt to do as he is told in order to gain approval.

( ) 4. Tries to make others laugh.
Credit this item if the child shows a tendency to repeat activities which have caused someone to laugh. Credit also if the child has passed this stage.

( ) 5. Shows affection.
This requires more than a passive response to affection. The child must actively participate in hugs and kisses etc.

( ) 6. Looks at mirror image with interest.
Score this point if the child shows an active interest in his image in a mirror, eg. reaches for it. Simply smiling at it is not enough. Credit this item also if the child has already passed this stage.

( ) 7. Claims possessions as own.
The child shows a sense of personal ownership, eg. guarding his toys from other children.

( ) 8. Waves bye-bye.
Score this point only if the child waves bye-bye in appropriate situations with a minimum of prompting, eg. a single verbal request.

( ) 9. Plays in company with others, but does not yet co-operate with others.
At this level the child may simply carry on with his own games, paying little attention to the other children, but the point is scored if he can play without interfering with others. Credit also if he has passed this stage and is already playing co-operatively with other children.

Contd./

( ) 10. Fetches and carries on request.
For this item the child should be able to:
a) respond correctly to a simple command eg. "Take the book to...", and
b) respond correctly to eg. "Fetch the cup" when the cup is in sight.
The point of this item is that the child should not only be able to respond to commands, but that such responses have become the accepted routine in assisting voluntarily parents, teachers etc.

( ) 11. Is pleased when shown pictures in books.
To score this point the child's interest must be sustained while looking at more than two or three pictures in succession.

( ) 12. Waits "his turn", can "share" at times.
If the child is sometimes able to take turns with other children when told to do so by an adult, and when he can <u>sometimes</u> share when he is told to do so, the point is scored. At this stage he is not expected to be able to wait or share either spontaneously or consistently.

( ) 13. Helps in domestic tasks, eg. clearing table etc.
The child, when encouraged to do so, will assist an adult in carrying out simple classroom or household tasks such as putting his toys away, watering plants etc., as far as his physical handicaps permit this. The task need not necessarily be well done, and at this stage it is not necessary for him to carry on with it on his own. Allowance should also be made for occasional refusals, but the item should be scored if the child is generally willing to help.

( ) 14. Plays co-operatively with others.
The child must participate in play <u>with other children</u>. Credit the item if the child participates in simple circle games or in any sort of play which involves passing of toys or other objects, eg. tea parties, doll play, playing house. More advanced play should also be credited.

( ) 15. Dances to music, sings/hums, plays records.
To score on this item the child must show some active interest in music, with some appreciation of rhythm and melody. The interest in music must be spontaneous.

( ) 16. Plays simple games eg. dominoes, snakes and ladders.
The point is credited if the child plays any simple table games with others and : a) waits his turn, b) has some idea of the rules of the game, so that he does not always have to be told what to do next, and c) has some understanding of the aim of the game.

Contd./

( ) 17. Plays simple ball games with others, eg. passing ball.
To score on this item the child must:
a) have the necessary motor control to play the game adequately
b) play with others, eg. pass the ball from one to the other.
(The child may be in a wheelchair).

( ) 18. Plays co-operative team games.
The child should have participated in organized team games (bowling, football, wheelchair dances), even if only occasionally. (The child may be in a wheelchair). The item is not credited if such a game has not been played recently.

( ) 19. Goes on simple errands outside the house or classroom.
This item is scored if the child can be sent on errands eg. to the school secretary, to neighbours (from home). It is not so important that the distance covered be large, as that the child has regular experience, by himself, of people outside the immediate home or classroom environment.

( ) 20. Is trusted with money on errands.
To score on this item the child must have been sent on errands with money on at least three different occasions, and must have delivered the money successfully each time (eg. mother sends money with child for a school outing). This implies that the child knows that money is valuable and the necessity of being careful with it.

( ) 21. Takes on minor responsibilities.
The child can carry out simple household or classroom tasks such as clearing the table or putting toys away:
a) on his own without adult help, although some supervision is permitted.
b) regularly, without having to be reminded constantly (occasional reminders may still be necessary, however).

( ) 22. Does not steal, or borrow without permission, other people's possessions.

( ) 23. Is polite, eg. knocks at doors, apologizes etc.
The child should show consideration of other people's requirements, such as obtaining chairs for sitting down, passing food or water at the table etc. Such behaviour should be unprompted.

( ) 24. Shares and/or lends his possessions.
This is a further example of social awareness of others, and requires a voluntary giving away of personal possessions. At its lowest level this item involves an element of sacrifice in the interests of an accepted convention (eg. sharing out sweets).

MANY THANKS FOR YOUR HELP

APPENDIX 16: Intercorrelations Among the Measures of Physical and Motor Status

i) The Bliss Group (n = 20):

	Mobility	Agility	Head	Locomotion	Sitting	Standing	Hearing	Acuity	Fits 1	Fits 2
PH	-0.63**	-0.68**	-0.45*	-0.53*	-0.89**	-0.43*	-0.41*	0.16	0.24	0.00
Mobility		0.75**	0.68**	0.69**	0.75**	0.42*	0.35*	0.09	-0.09	-0.02
Agility			0.59*	0.59*	0.67**	0.23	0.31	-0.11	-0.24	-0.05
Head				0.80**	0.61*	0.54*	0.15	-0.15	-0.42*	-0.27
Locomotion					0.63*	0.63*	0.05	0.25	-0.29	-0.33
Sitting						0.50*	0.45*	-0.18	-0.30	-0.05
Standing							0.05	0.09	-0.14	-0.33
Hearing								-0.08	0.16	0.36
Acuity									0.36	-0.10
Fits 1										0.58*

ii) The BSL (Makaton)Group (n = 20):

	Mobility	Agility	Head	Locomotion	Sitting	Standing	Hearing	Acuity	Fits 1	Fits 2
PH	-0.58**	-0.58**	-0.53*	-0.74**	-0.61*	-0.72**	-0.06	-0.06	-0.20	-0.31
Mobility		0.73**	0.56*	0.76**	0.60**	0.62**	0.02	0.02	0.02	0.30
Agility			0.48*	0.62**	0.56*	0.61**	0.20	0.02	0.17	0.22
Head				0.57*	0.48*	0.55*	0.10	0.10	0.03	0.17
Locomotion					0.65**	0.77**	-0.25	0.18	0.29	0.33
Sitting						0.60*	0.11	0.11	0.14	0.20
Standing							-0.02	0.25	0.02	-0.03
Hearing								-0.05	-0.18	-0.10
Acuity									-0.18	-0.10
Fits 1										0.55*

APPENDIX 17: Correlations Between the Expressive Language and Imitation Measures and the Cognitive and Physical Handicap Measures

I) The Bliss group (n = 20):

	Columbia MMS	Raven's CPM	Severity of Physical Handicap
	tau	tau	tau
Number of spoken words	0.12	-0.03	-0.17
Intelligibility of speech	-0.14	0.01	0.07
Development of Sounds - total	0.06	-0.05	-0.12
Reynell Expression - raw score	0.03	-0.09	-0.26
Verbal imitation - total	0.05	-0.11	-0.11
Motor imitation - total	0.29*	-0.01	-0.44*
Expression of natural gestures	0.08	-0.13	-0.40*

II) The Makaton group (n = 20):

	Columbia MMS	Raven's CPM	Severity of Physical Handicap
	tau	tau	tau
Number of spoken words	0.35*	0.26	-0.27
Intelligibility of speech	0.23	-0.17	-0.07
Development of sounds - total	0.32*	-0.01	-0.16
Reynell Expression - raw score	0.27	0.27	-0.28
Verbal imitation - total	0.23	0.27	-0.30
Motor imitation - total	0.36*	0.23	-0.19
Expression of natural gestures	0.57**	0.37*	-0.27

APPENDIX 18: Intercorrelations Among the Measures of Language Expression and Comprehension

i) The Bliss Group (n = 20)

	EPVT	Gestural Compre-hension	SPT	Number Spoken Words	Speech Intelli-gibility	Sound dev.	Reynell Expression	Verbal imit.	Sound imit.	Word imit.	Motor imit.	Arm imit.	Hand + finger imit.	Gestural Expression
Reynell Comprehension	0.67**	0.61**	0.47*	0.04	0.10	-0.04	-0.06	-0.13	-0.15	-0.03	0.03	0.20	-0.12	0.10
EPVT		0.68**	0.47*	0.05	-0.11	-0.16	-0.07	-0.17	-0.19	-0.04	0.13	0.29	-0.01	0.17
Gestural Comprehension			0.50*	0.24	0.30	0.01	0.10	-0.04	-0.07	0.16	0.16	0.30	0.01	0.26
SPT				-0.25	0.16	-0.32*	-0.27	-0.45*	-0.47*	-0.17	-0.08	0.08	-0.15	0.09
No. of spoken words					0.86**	0.51*	0.60**	0.70**	0.66**	0.81**	0.39*	0.29	0.34*	0.26
Speech intelligibility						0.44*	0.53*	0.60**	0.54*	0.78**	0.38*	0.31	0.29	0.28
Sound development							0.41*	0.57**	0.57**	0.40*	0.18	0.10	0.21	0.05
Reynell Expression								0.72**	0.71**	0.48*	0.33*	0.30*	0.26	0.27
Verbal imitation - tot									0.98**	0.58*	0.21	0.21	0.13	0.08
Sound imitation										0.51*	0.21	0.21	0.12	0.06
Word imitation											0.24	0.15	0.17	0.10
Motor imitation - tot												0.77**	0.76**	0.63**
Imitation arm move													0.42*	0.54**
Imitation hand + finger														0.54**
Gestural Expression														

APPENDIX 18: Intercorrelations Among the Measures of Language Expression and Comprehension

ii) The Makaton Group (n = 20)

	EPVT	Gestural Comprehension	SPT	Number Spoken words	Speech Intelligibility	Sound development	Reynell Expression	Verbal imit.	Sound imit.	Word imit.	Motor imit.	Arm imit.	Hand + finger imit.	Gestural Expression
Reynell Comprehension	0.75**	0.51**	0.19	0.36*	0.45*	0.15	0.34*	0.29*	0.31*	0.19	0.05	0.12	0.02	0.48*
EPVT		0.65*	0.19	0.51*	0.56**	0.20	0.44*	0.36*	0.36*	0.32*	0.17	0.25	0.14	0.55**
Gestural Comprehension			0.47*	0.37*	0.46*	0.21	0.34*	0.26	0.26	0.29	0.47*	0.45*	0.43*	0.62**
SPT				0.07	0.03	0.19	0.10	0.02	0.01	0.01	0.45*	0.42*	0.43*	0.34*
No. of spoken words					0.68**	0.68**	0.86**	0.66**	0.63**	0.71**	0.13	0.12	0.09	0.45*
Speech intelligibility						0.47*	0.58**	0.43*	0.41*	0.49*	0.04	0.01	0.09	0.54**
Sound development							0.52**	0.45*	0.45*	0.49*	0.05	0.02	0.04	0.41*
Reynell Expression								0.68**	0.64**	0.65**	0.16	0.14	0.12	0.34*
Verbal imitation - tot									0.96**	0.76**	0.06	0.16	-0.05	0.26
Sound imitation										0.69**	0.06	0.14	-0.04	0.23
Word imitation											0.12	0.19	0.00	0.24
Motor imitation - tot												0.81**	0.85**	0.28*
Imitation arm move													0.59**	0.29
Imitation hand + finger														0.27
Gestural Expression														

APPENDIX 19: Examples of Blissymbol and BSL (Makaton) Sign Utterances Produced in Recording Sessions (written in English gloss format)

Child 1: Bliss User

Speaker	Utterance	Description of Speech Event and Behaviour
Adult :	What happened yesterday?	
Child :	TELEVISION	
Adult :	You watched television?	Child nods head
Child :	FOOD DRINK	Looking at picture of family seated at dinner table
	BED	Looking at picture of boy lying in bed
Adult :	What's happening?	
Child :	SLEEP	As above i.e. the boy is sleeping
	TABLE	Points to miniature toy (a table) in front of him
Adult :	Look at that	
Child :	SCHOOL	Looking at picture of children seated at desks in front of a blackboard

Child 2: Bliss User

Speaker	Utterance	Description of Speech Event and Behaviour
Adult :	What news can you tell me?	
Child :	MOTHER I TELL MY WHEELCHAIR	
Adult :	You told Mummy about your wheelchair?	Child nods head
Adult :	What did you tell her?	
Child :	IN WHEELCHAIR WALK I	Interpretation - that I am in a wheelchair
Adult :	You walk?	Child shakes head
Adult :	You <u>want</u> to walk?	Child nods head
Adult :	What did Mummy say?	
Child :	LOVE ME	Interpretation - she said she loves me
	ANGRY BABY	
Adult :	The baby is angry?	Child shakes head
Adult :	You were cross about the baby?	Child shakes head
Adult :	Are you angry because you are like a baby?	Child nods head vigorously Interpretation - I am angry because I have to be looked after like a baby, I can't walk etc.

Cont.

<u>Child 3: Sign User</u>

Speaker	Utterance	Description of Speech Event and Behaviour
Child :	MUMMY BOY	Looking at picture of a woman and child playing
Adult :	Look at this. What's happening?	
Child :	BOY SLEEP	Looking at picture of a boy lying in bed
	MUMMY	Points to picture of a woman
	GOODBYE	Looking at picture of a boy waving
Adult :	What's that?	
Child :	SWIM	Points to picture of children swimming
	LADY FALL	As doll falls off the table
	CAR	Playing with toy car in front of him
Adult :	What are you doing?	
Child :	PLATE	After putting toy plate in mouth - pretending to eat

<u>Child 4: Sign User</u>

Speaker	Utterance	Description of Speech Event and Behaviour
Child :	MAN	Looking at picture of a man sleeping
	SLEEP	As above
	CAR WHERE	Looks around for toy car Interpretation - where is the car?
	YOU EAT	Pretends to feed adult
Adult :	Look. What's that?	
Child :	CLIMB	Looking at picture of boys climbing a tree
	MAN FISH	Looking at picture of man fishing
Adult :	What's the matter?	
Child :	CAR	Looking around. Interpretation - I want the toy car / where is the car
	BALL UP	As throws ball up in the air

APPENDIX 20: Syntactic Analysis of Blissymbol and Makaton Sign Language Samples - Mean Number of Utterances and Percentage of Total Utterances Scored in the LARSP Categories

LARSP Category	Bliss Users (n = 20) Mean	%	Makaton Users (n = 15) Mean	%	Difference bet.groups on % Frequency t
Incomprehensible	0.15	1.05	0.00	0.00	1.31
Stereotypes	0.00	0.00	0.00	0.00	0.00
Ambiguous	0.25	1.30	0.25	0.67	0.55
Minor	0.55	1.85	0.13	1.47	0.23
Stage I					
Command V	0.00	0.00	0.00	0.00	0.00
Question Q	0.10	0.50	0.00	0.00	0.86
Verb	0.80	6.35	1.73	19.80	2.20*
Noun	6.30	58.50	6.33	62.40	0.40
Other	0.25	1.90	1.07	7.20	1.97
Stage II - Clauses					
Command + X	0.00	0.00	0.00	0.00	0.00
Question + X	0.15	0.90	0.13	0.67	0.28
Subject + verb	0.45	3.00	0.47	2.53	0.24
Subject+object/complement	0.40	3.00	0.27	1.20	1.17
Negative + X	0.00	0.00	0.00	0.00	0.00
Adverbial + X	1.15	7.25	0.13	0.80	3.15*
Verb+object/complement	0.05	0.40	0.00	0.00	0.86
Other clauses	0.00	0.00	0.00	0.00	0.00
Stage II - Phrases					
Determiner + noun	0.00	0.00	0.13	0.87	1.16
Adjective + noun	0.05	0.30	0.00	0.00	0.86
Noun + noun	0.90	5.30	0.13	0.60	2.23*
Preposition + noun	0.40	2.00	0.00	0.00	1.21
Verb + verb	0.15	0.70	0.07	0.33	0.67
Verb + particle	0.00	0.00	0.00	0.00	0.00
Intensifier + X	0.00	0.00	0.00	0.00	0.00
Other phrases	0.05	0.15	0.07	0.33	0.55
Stage II - Expansions					
Subject expansions	0.15	0.85	0.00	0.00	1.38
Verb expansions	0.05	0.15	0.00	0.00	0.86
Object/Complement expans.	0.00	0.00	0.00	0.00	0.00
Adverbial expansions	0.15	0.85	0.00	0.00	1.47

APPENDIX 20 cont.

LARSP Category	Bliss Users (n = 20) Mean	%	Makaton Users (n = 15) Mean	%	Difference bet. groups on % Frequency t
Stage III - Clauses					
Command + X + Y	0.00	0.00	0.00	0.00	0.00
Command let + X +Y	0.00	0.00	0.00	0.00	0.00
Command do + X + Y	0.00	0.00	0.00	0.00	0.00
Question + X + Y	0.10	0.30	0.00	0.00	0.86
Verb - subject inversion	0.00	0.00	0.00	0.00	0.00
Subject+verb+obj./compl.	0.30	1.70	0.00	0.00	1.38
Subject+verb+adverbial	0.45	3.45	0.00	0.00	1.19
Negative + X + Y	0.00	0.00	0.00	0.00	0.00
Verb+compl./obj.+adverb	0.00	0.00	0.00	0.00	0.00
Verb+direct obj.+ indir.obj.	0.00	0.00	0.00	0.00	0.00
Other clauses	0.25	1.15	0.00	0.00	1.58
Stage III - Phrases					
Determiner+adj.+ noun	0.00	0.00	0.00	0.00	0.00
Adj.+ adj.+ noun	0.00	0.00	0.00	0.00	0.00
Preposition+determiner+noun	0.00	0.00	0.00	0.00	0.00
Pronoun	1.15	8.95	1.00	6.80	0.35
Copula	0.00	0.00	0.00	0.00	0.00
Auxiliary verb	0.00	0.00	0.00	0.00	0.00
Other Phrases	0.25	2.20	0.13	0.60	1.23
Stage III - Expansions					
Subject expansions	0.00	0.00	0.00	0.00	0.00
Verb expansions	0.05	0.25	0.00	0.00	0.86
Object/complement exp.s	0.05	0.25	0.00	0.00	0.86
Adverbial expansions	0.15	0.45	0.00	0.00	0.86
Stage IV - Clauses					
Command + subject	0.00	0.00	0.00	0.00	0.00
Command + X + Y +	0.00	0.00	0.00	0.00	0.00
Question+verb-subj.inversion	0.00	0.00	0.00	0.00	0.00
Question + X + Y +	0.05	0.15	0.00	0.00	0.86
Verb-subject inversion +X+	0.00	0.00	0.00	0.00	0.00
Tag question	0.00	0.00	0.00	0.00	0.00
Subject+verb+obj.+ adverb	0.00	0.00	0.00	0.00	0.00
Subject+verb+obj.+ obj.	0.00	0.00	0.00	0.00	0.00
Subject+verb+object+compl.	0.00	0.00	0.00	0.00	0.00
Adverbial+adverbial+X+Y	0.00	0.00	0.00	0.00	0.00
Other clauses	0.00	0.00	0.00	0.00	0.00

APPENDIX 20 cont.

LARSP Category	Bliss Users (n = 20) Mean	%	Makaton Users (n = 15) Mean	%	Difference bet.groups on % Frequency t
Stage IV - Phrases					
Noun ph.+ prep.+ noun ph.	0.00	0.00	0.00	0.00	0.00
Prep.+determ.+ adj.+ noun	0.00	0.00	0.00	0.00	0.00
Conjunction + X	0.00	0.00	0.00	0.00	0.00
X + conjunction + X	0.05	0.15	0.00	0.00	0.86
Negative + verb	0.00	0.00	0.00	0.00	0.00
Negative + X	0.00	0.00	0.00	0.00	0.00
2 auxiliary verbs	0.00	0.00	0.00	0.00	0.00
Other phrases	0.00	0.00	0.13	0.60	1.16
Stage V					
Connectivity 'and'	0.05	0.15	0.00	0.00	0.86
Connectivity coord.	0.00	0.00	0.00	0.00	0.00
Connectivity subord.	0.00	0.00	0.00	0.00	0.00
Connectivity other	0.00	0.00	0.00	0.00	0.00
Command coord.	0.00	0.00	0.00	0.00	0.00
Command other	0.00	0.00	0.00	0.00	0.00
Question coord.	0.00	0.00	0.00	0.00	0.00
Question other	0.00	0.00	0.00	0.00	0.00
Coord. clause 1	0.00	0.00	0.00	0.00	0.00
Coord. clause 1 +	0.00	0.00	0.00	0.00	0.00
Subord. clause 1	0.00	0.00	0.00	0.00	0.00
Subord. clause 1 +	0.00	0.00	0.00	0.00	0.00
Comparative	0.00	0.00	0.00	0.00	0.00
Postmodifying clause 1	0.00	0.00	0.00	0.00	0.00
Postmodifying clause 1 +	0.00	0.00	0.00	0.00	0.00
Postmodifying phrase 1	0.00	0.00	0.00	0.00	0.00
Postmodifying phrase 1 +	0.00	0.00	0.00	0.00	0.00

APPENDIX 21: Communicative Functions Expressed in the Sign and Symbol utterances - Mean Number of Utterances Expressing Each Communicative Function

Communicative Function	Bliss Users (n = 20) Mean	%	Makaton Users (n = 15) Mean	%	Difference bet. groups on % Frequency t
Requests - total	1.55	12.60	0.67	10.13	0.33
Yes/no questions	0.05	0.40	0.00	0.00	0.86
Wh-questions	0.20	1.00	0.20	0.80	0.17
Action requests	1.30	11.20	0.47	9.33	0.25
Permission requests	0.00	0.00	0.00	0.00	0.00
Rhetorical questions	0.00	0.00	0.00	0.00	0.00
Responses - total	7.05	57.95	4.87	49.53	0.92
Yes/no answers	0.50	1.50	0.00	0.00	1.12
Wh-answers	6.45	55.85	4.87	49.53	0.69
Compliances	0.00	0.00	0.00	0.00	0.00
Qualifications	0.10	0.55	0.00	0.00	1.13
Repetitions	0.00	0.00	0.00	0.00	0.00
Descriptions - total	3.35	23.85	5.07	31.40	1.09
Identifications	0.90	8.75	3.60	23.47	2.85*
Descriptions of events	1.50	10.10	1.07	6.27	0.91
Descriptions of properties	0.25	1.45	0.20	0.67	0.80
Descriptions of locations	0.50	3.05	0.20	1.00	1.54
Descriptions of time	0.20	0.60	0.00	0.00	0.86
Statements - total	0.45	2.75	0.13	7.00	0.63
Rules	0.00	0.00	0.00	0.00	0.00
Evaluations	0.00	0.00	0.00	0.00	0.00
Internal reports	0.40	2.60	0.07	6.67	0.60
Attributions	0.05	0.15	0.00	0.00	0.86
Explanations	0.00	0.00	0.07	0.33	1.16
Organization Devices-total	0.05	0.30	0.00	0.00	0.86
Boundary markers	0.00	0.00	0.00	0.00	0.00
Calls	0.00	0.00	0.00	0.00	0.00
Speaker selections	0.00	0.00	0.00	0.00	0.00
Politeness markers	0.05	0.30	0.00	0.00	0.86
Accompaniments	0.00	0.00	0.00	0.00	0.00
Performatives - total	0.00	0.00	0.00	0.00	0.00
Protests	0.00	0.00	0.00	0.00	0.00
Jokes	0.00	0.00	0.00	0.00	0.00
Claims	0.00	0.00	0.00	0.00	0.00
Warnings	0.00	0.00	0.00	0.00	0.00

APPENDIX 21: cont.

Communicative Function	Bliss Users (n = 20)		Makaton Users (n = 15)		Difference bet. groups on % Frequency
	Mean	%	Mean	%	*t*
Teases	0.00	0.00	0.00	0.00	0.00
Other Functions	0.00	0.00	0.00	0.00	0.00
Uninterpretable	0.25	1.65	0.40	2.07	0.34

APPENDIX 22: Intercorrelations Among Measures of Syntactic, Semantic and Pragmatic Analysis

i) The Bliss Group (n = 20)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Symbols expressed	0.99**	0.12	0.18	0.04	0.36	-0.11	0.37	-0.45*	0.44*	0.46*	-0.11	0.00	0.27	0.27	0.14
2. Symbols comprehended		0.14	0.19	0.06	0.37	-0.09	0.38	-0.45*	0.46*	0.48*	-0.12	-0.02	0.26	0.26	0.12
3. Total utt.s produced			0.89**	0.91**	0.40*	0.86**	0.73**	-0.42*	0.74**	0.60*	0.48	0.15	0.49*	0.49*	0.47*
4. Total spontaneous utt.s				0.62*	0.56*	0.62*	0.85**	-0.56*	0.80**	0.73**	0.61*	0.23	0.61*	0.61*	0.48*
5. Total response utt.s					0.17	0.92**	0.47*	-0.21	0.55*	0.37	0.27	0.05	0.29	0.29	0.35
6. MSLU						-0.05	0.83**	-0.95**	0.62*	0.53*	0.82**	0.73**	0.44*	0.44*	0.53*
7. 1-term utt.s							0.23	0.01	0.38*	0.26	0.11	-0.15	0.16	0.17	0.14
8. Multi-term utt.s								-0.80**	0.89**	0.79**	0.76**	0.47*	0.71**	0.71**	0.71*
9. % entries I out of I-V									-0.67**	-0.52*	-0.71**	-0.71**	-0.31	-0.31	-0.46*
10. Stage II clauses										0.63**	0.55*	0.28	0.66**	0.66**	0.73**
11. Stage II phrases											0.32	0.02	0.68**	0.68**	0.45*
12. Stage III clauses												0.77**	0.47*	0.47*	0.49*
13. Stage III phrases													0.05	0.05	0.22
14. Stage IV clauses														1.00**	0.79**
15. Stage IV phrases															0.79**

APPENDIX 22: Bliss Group cont.

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. Symbols expressed	0.51*	-0.03	0.24	-0.25	0.06	0.40	-0.38	-0.25	-0.34	0.04	0.05	0.04	0.17	0.10	0.27
2. Symbols comprehended	0.49*	-0.01	0.28	-0.24	0.02	0.43	-0.38	-0.29	-0.35	0.02	0.04	0.06	0.19	0.09	0.30
3. Total utt.s produced	-0.10	0.00	0.05	0.00	0.70*	0.51*	-0.07	0.17	-0.17	0.38	0.30	0.90**	0.65**	0.35	0.10
4. Total spontaneous utt.s	0.06	-0.05	0.11	-0.11	0.53*	0.73**	-0.21	0.23	-0.13	0.57*	0.50*	0.61*	0.81**	0.57*	0.16
5. Total response utt.s	-0.22	0.05	0.03	0.11	0.69*	0.19	0.09	0.08	-0.17	0.11	0.05	1.00	0.73**	0.08	0.03
6. MSLU	0.12	0.02	0.09	-0.11	-0.01	0.46*	0.01	0.29	0.62*	0.81**	0.28	0.17	0.38	0.57*	0.15
7. 1-term utt.s	-0.16	-0.08	-0.04	-0.02	0.68*	0.13	0.00	0.00	-0.28	0.02	0.08	0.92**	0.71**	0.05	0.01
8. Multi-term utt.s	0.05	0.12	0.16	0.03	0.34	0.80**	0.68*	-0.13	0.34	0.09	0.70*	0.45*	0.46*	0.65**	0.60*
9. % entries I out of I-V	-0.26	-0.13	-0.17	0.03	-0.12	-0.41	-0.05	-0.38	-0.51*	-0.64*	-0.35	-0.21	-0.33	-0.60*	-0.21
10. Stage II clauses	0.12	0.38	-0.11	0.11	0.54*	0.67*	-0.02	0.33	-0.25	0.28	0.48*	0.55*	0.60*	0.61*	-0.02
11. Stage II phrases	0.09	-0.22	0.58*	-0.18	0.19	0.94**	-0.41	-0.15	-0.15	0.61*	0.21	0.35	0.70**	0.17	0.59*
12. Stage III clauses	-0.19	0.14	-0.19	0.14	0.11	0.30	0.12	0.58*	0.57*	0.70*	0.44*	0.26	0.35	0.68**	-0.13
13. Stage III phrases	0.11	0.17	-0.08	0.20	0.09	-0.11	0.33	0.64*	0.64*	0.45*	0.29	0.05	-0.02	0.54*	-0.04
14. Stage IV clauses	-0.07	-0.15	-0.07	-0.15	0.26	0.78**	-0.18	-0.11	-0.10	0.55*	0.15	0.26	0.65**	0.16	-0.05
15. Stage IV phrases	-0.07	-0.15	-0.07	-0.15	0.26	0.78**	-0.18	-0.11	-0.10	0.55*	0.15	0.26	0.65**	0.16	-0.05

APPENDIX 22: Bliss Group cont.

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
16. Agent - action	0.38	-0.10	0.28	-0.10	0.51*	0.47*	0.27	-0.01	0.13	0.38	0.02	0.34	0.57*	0.14	-0.25
17. Action - object		-0.19	0.78**	-0.15	0.26	0.02	0.03	-0.12	-0.10	-0.20	0.13	-0.21	-0.01	0.12	-0.07
18. Agent - object			-0.19	0.31	-0.06	-0.10	0.21	0.62*	-0.21	-0.29	0.42	0.07	-0.39	0.58*	-0.15
19. Modifier - head				-0.15	-0.18	0.40	-0.29	-0.12	-0.10	0.36	-0.10	-0.02	0.12	-0.18	1.00**
20. Action - location					0.00	-0.18	0.24	0.58*	0.00	-0.34	0.12	0.13	-0.21	0.13	-0.15
21. Agent - location						0.09	0.29	0.12	-0.24	-0.03	0.13	0.70*	0.58*	0.05	-0.18
22. Other 2-term rel.s							-0.53*	-0.09	-0.21	0.60*	0.25	0.16	0.63*	0.23	0.40
23. % 2-term relations								0.16	0.29	-0.19	-0.25	0.13	-0.09	-0.03	-0.29
24. Exp-state-source									0.07	0.02	0.68*	0.10	-0.27	0.75**	-0.12
25. Ag-act-loc										0.50*	-0.29	-0.16	-0.03	0.03	-0.10
26. Other 3-term rel.s											0.02	0.10	0.53*	0.23	0.36
27. Requests												0.02	-0.08	0.82**	-0.06
28. Responses													0.73**	0.09	0.04
29. Descriptions														0.03	0.15
30. Statements															-0.13
31. Organization devices															

APPENDIX 22: ii) The BSL (Makaton) Group (n = 15)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Signs expressed	0.92**	0.51*	0.33	0.62*	0.51*	0.35	0.51*	-0.40	0.32	0.55*	-	0.34	-	0.65*	0.62
2. Signs comprehended		0.75**	0.62*	0.67*	0.60*	0.56*	0.63*	-0.59*	0.57*	0.59*	-	0.64*	-	0.56*	0.49
3. Total utt.s produced			0.92**	0.74**	0.37	0.92**	0.45*	-0.48*	0.50*	0.32	-	0.77**	-	0.29	-0.79
4. Total spontaneous utt.s				0.43*	0.44*	0.80**	0.53*	-0.57*	0.63*	0.37	-	0.82**	-	0.29	-0.90
5. Total response utt.s					0.10	0.78**	0.12	-0.12	0.08	0.11	-	0.39	-	0.18	-0.34
6. MSLU						-0.02	0.99**	-0.95**	0.89**	0.99**	-	0.60*	-	0.82**	0.99*
7. 1-term utt.s							0.07	-0.12	0.17	-0.06	-	0.58*	-	-0.01	-0.91
8. Multi-term utt.s								-0.96**	0.92**	0.97**	-	0.67**	-	0.80**	0.99*
9. % entries I out of I-V									-0.97**	-0.89**	-	-0.80**	-	-0.62*	-0.90
10. Stage II clauses										0.81**	-	0.83**	-	0.50*	0.66
11. Stage II phrases											-	0.50*	-	0.89**	0.98
12. Stage III clauses												-	-	-	-
13. Stage III phrases													-	0.23	-0.50
14. Stage IV clauses														-	-
15. Stage IV phrases															0.76

APPENDIX 22: BSL (Makaton) Group cont.

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. Signs expressed	-0.65	-0.33	-0.65	-	0.76	0.98	-0.34	-	-	0.98	-0.02	0.63*	0.30	0.31	-
2. Signs comprehended	-0.76	-0.18	-0.76	-	0.65	0.94	-0.48	-	-	0.94	0.26	0.64*	0.59*	0.31	-
3. Total utt.s produced	-0.75	0.95	-0.75	-	-0.67	-0.21	-0.94	-	-	-0.21	0.50*	0.64*	0.92**	0.02	-
4. Total spontaneous utt.s	-0.60	0.99*	-0.60	-	-0.80	-0.40	-0.85	-	-	-0.40	0.59*	0.30	0.99**	0.08	-
5. Total response utt.s	-0.99*	0.63	-0.99*	-	-0.16	0.36	-0.98	-	-	0.36	0.14	0.98**	0.42	-0.11	-
6. MSLU	0.15	-0.93	0.15	-	0.99*	0.78	0.49	-	-	0.78	0.21	0.11	0.40	0.52*	-
7. 1-term utt.s	-0.58	0.99*	-0.58	-	-0.81	-0.41	-0.84	-	-	-0.41	0.44*	0.66*	0.81**	-0.20	-
8. Multi-term utt.s	0.12	-0.92	0.12	-	0.99*	0.80	0.46	-	-	0.80	0.27	0.12	0.49*	0.50*	-
9. % entries I out of I-V	-0.61	0.99*	-0.61	-	-0.80	-0.39	-0.85	-	-	-0.39	-0.49*	-0.11	-0.52*	-0.36	-
10. Stage II clauses	0.87	-0.87	0.87	-	0.50	0.00	0.99*	-	-	0.00	0.50*	0.05	0.59*	0.28	-
11. Stage II phrases	0.00	-0.87	0.00	-	1.00**	0.87	0.36	-	-	0.87	0.12	0.13	0.33	0.58*	-
12. Stage III clauses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13. Stage III phrases	0.76	0.19	0.76	-	-0.66	-0.95	0.47	-	-	-0.95	0.75**	0.32	0.76**	0.03	-
14. Stage IV clauses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15. Stage IV phrases	-0.50	-0.50	-0.50	-	0.87	1.00**	-0.16	-	-	1.00**	-0.17	0.20	0.28	0.68*	-

APPENDIX 22: BSL (Makaton) Group cont.

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
16. Agent - action	0.19	-0.95	0.19	-	0.98	0.76	0.53	-	-	0.76	-0.50	0.22	-0.88	0.76	-
17. Action - object		-0.50	1.00**	-	0.00	-0.50	0.93	-	-	-0.50	0.76	-0.92	-0.64	-0.50	-
18. Agent - object			-0.50	-	-0.87	-0.50	-0.78	-	-	-0.50	0.19	0.12	0.99	-0.50	-
19. Modifier - head				-	0.00	-0.50	0.93	-	-	-0.50	0.76	-0.92	-0.64	-0.50	-
20. Action - location					-	-	-	-	-	-	-	-	-	-	-
21. Agent - location						0.87	0.36	-	-	-	-0.66	0.40	-0.77	0.87	-
22. Other 2-term rel.							-0.16	-	-	-	-0.95	0.80	-0.35	1.00**	-
23. % 2-term rel.s								-	-	-0.16	0.47	-0.71	-0.87	-0.16	-
24. Exp.-state-source									-	-	-	-	-	-	-
25. Ag-act-loc										-	-	-	-	-	-
26. Other 3-term rel.s											-0.95	0.80	-0.35	1.00**	-
27. Requests												0.08	0.51*	-0.24	-
28. Responses													0.28	-0.08	-
29. Descriptions														0.06	-
30. Statements															-
31. Organization devices															

APPENDIX 23: Correlates of the Measures of Syntactic, Semantic and Pragmatic Analysis

i) The Bliss Group (n = 20)

Key: 1. Age 2. Severity of handicap 3. Columbia Interlevel Scale 4. Frostig Form Perception 5. Frostig Position in Space 6. Pre-symbol Assess. 7. Reynell Expression 8. Reynell Comprehension 9. Verbal imitation 10. Motor imitation 11. Gestural expression 12. Gestural Comprehension 13. Symbolic Play Test 14. Time on Bliss/Makaton pre-study 15. Weekly teaching time 16. Exposure to signs/symbols at school

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Symbols expressed	0.49*	0.22	0.62*	0.53*	0.24	0.65**	-0.09	0.51*	0.08	0.01	-0.07	0.43*	0.33	0.51*	0.21	0.41*
Symbols comprehended	0.53*	0.19	0.57*	0.56*	0.25	0.66**	-0.10	0.53*	0.06	0.00	-0.02	0.46*	0.36	0.52*	0.24	0.41*
Total utt.s produced	0.38	-0.08	0.23	0.09	0.16	0.05	0.61*	0.07	0.48*	0.44*	0.28	0.24	0.19	0.32	0.18	0.33*
MSLU	0.27	-0.16	0.27	0.23	0.41*	0.63*	0.63**	0.39*	0.45*	0.57*	0.32	0.46*	0.25	-0.06	0.04	0.18
Multi-term utt.s	0.34	-0.18	0.34	0.04	0.30	0.44*	0.63**	0.17	0.68**	0.53*	0.30	0.34	0.17	0.12	0.24	0.27
% entries I out of I-V	-0.31	0.14	-0.57*	-0.36	-0.49*	-0.69**	-0.57*	-0.51*	-0.33	-0.56*	-0.41*	-0.58*	-0.37	-0.11	-0.09	-0.13
Stage II clauses	0.33	0.08	0.35	0.15	0.16	0.37	0.58*	0.26	0.61*	0.37	0.22	0.35	0.23	0.26	0.30	0.28
Stage II phrases	0.49*	-0.21	0.25	-0.03	0.22	0.32	0.32	-0.06	0.52*	0.31	0.21	0.20	0.05	0.18	0.37	0.36*
Stage III clauses	0.01	-0.24	0.35	-0.08	0.30	0.31	0.79**	0.14	0.58*	0.61*	0.34	0.23	0.08	-0.26	-0.15	0.06
Stage III phrases	0.07	-0.20	0.38*	0.14	0.51*	0.39*	0.66**	0.35	0.27	0.60*	0.39*	0.32	0.16	-0.08	-0.22	0.02

APPENDIX 23: Bliss Group cont.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Stage IV clauses	0.24	-0.28	0.05	-0.34	-0.17	0.12	0.52*	-0.24	0.88*	0.19	-0.01	-0.02	-0.17	-0.16	0.32	0.13
Stage IV phrases	0.24	-0.28	0.05	-0.34	-0.17	0.12	0.52*	-0.24	0.88*	0.19	-0.01	-0.03	-0.17	-0.16	0.32	0.13
Agent - action	0.21	0.17	0.11	-0.30	-0.19	0.04	0.65*	-0.20	0.85**	0.30	0.02	0.05	-0.17	-0.39	0.20	-0.25
Action - object	0.05	0.18	0.15	0.32	0.03	0.28	-0.19	0.27	-0.13	-0.23	-0.12	0.19	0.08	0.24	-0.09	0.11
Agent - object	-0.44	0.16	0.14	0.07	0.27	0.11	0.03	0.31	-0.09	0.37	0.26	0.08	0.19	0.12	-0.16	-0.26
Modifier - head	0.44*	-0.51*	0.10	0.06	0.40	0.18	-0.15	-0.14	-0.13	0.28	0.32	0.19	0.16	0.29	0.23	0.11
Action - location	0.09	0.40	-0.03	0.13	0.00	0.10	0.07	0.36	-0.06	-0.23	-0.08	0.20	0.22	0.04	0.21	0.23
Agent - location	0.32	0.22	0.03	-0.02	-0.09	-0.31	0.55*	-0.13	0.46*	0.10	0.07	0.14	0.02	0.31	0.10	0.27
Other 2-term rel.s	0.30	-0.35	0.14	-0.21	0.05	0.32	0.25	-0.31	0.62*	0.23	0.17	0.06	-0.12	-0.06	0.21	0.13
% 2-term rel.s	0.10	0.39*	-0.19	0.03	-0.31	-0.24	0.27	0.11	0.05	0.07	-0.02	0.13	0.31	-0.30	0.23	-0.24
Exp-state-source	-0.48*	-0.24	0.23	-0.06	0.44*	0.15	0.39	0.26	0.09	0.45*	0.41	0.20	0.14	0.09	-0.30	-0.22
Ag-act-loc	-0.09	-0.13	0.23	0.12	0.21	0.27	0.40	0.21	0.06	0.34	0.21	0.26	0.03	0.09	-0.45*	0.11
Other 3-term rel.s	0.20	-0.59*	0.32	-0.17	0.22	0.30	0.58*	-0.24	0.59*	0.60*	0.32	0.17	-0.04	-0.02	-0.20	-0.14

APPENDIX 23: Bliss Group cont.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Requests	-0.15	-0.30	0.10	-0.16	0.42*	0.17	0.22	0.09	0.16	0.36	0.47*	0.10	0.01	0.33	-0.12	0.36*
Responses	0.41*	0.03	0.21	0.20	0.12	-0.08	0.51*	0.14	0.29	0.35	0.17	0.23	0.23	0.39*	0.19	0.24
Descriptions	0.45*	-0.10	0.14	0.03	-0.15	0.02	0.52*	-0.13	0.58*	0.20	0.01	0.14	0.08	0.04	0.26	0.06
Statements	-0.19	-0.17	0.33	0.10	0.37	0.39*	0.36	0.28	0.19	0.49*	0.38*	0.25	0.21	0.08	-0.23	-0.07
Organization devices	0.38*	0.44*	0.14	0.10	0.41*	0.20	-0.11	-0.04	-0.12	0.28	0.27	0.17	0.15	0.30	0.25	0.13

APPENDIX 23: ii) The BSL (Makaton) Group (n = 15)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Signs expressed	0.15	-0.33*	0.64**	0.44**	0.27	0.26	0.20	0.33	0.12	0.66**	0.67**	0.55*	0.44*	0.64*	0.33	0.56*
Signs comprehended	0.09	-0.39*	0.77**	0.35	0.52*	0.40*	0.29	0.31	0.27	0.74**	0.72**	0.63**	0.44*	0.58*	0.15	0.46*
Total utt.s produced	-0.09	-0.16	0.79**	0.51*	0.83**	0.59*	0.14	-0.12	-0.05	0.69*	0.56*	0.52*	0.46*	0.25	0.07	0.03
MSLU	0.39	0.00	0.59*	0.35	0.33	0.35	0.36	0.43*	0.06	0.62*	0.62*	0.42	0.21	0.21	-0.03	-0.08
Multi-term utt.s	0.36	0.00	0.63*	0.33	0.41	0.40	0.38	0.43	0.06	0.64*	0.63*	0.44*	0.23	0.18	-0.05	-0.08
% entries I out of I-V	-0.19	0.00	-0.65*	-0.31	-0.52*	-0.53*	-0.40	-0.43	-0.13	-0.56*	-0.70*	-0.46*	-0.29	-0.10	0.15	0.09
Stage II clauses	0.14	0.00	0.62*	0.17	0.54*	0.57*	0.48*	0.36	0.21	0.51*	0.64*	0.45*	0.27	0.04	-0.15	-0.08
Stage II phrases	0.45*	0.00	0.55*	0.39	0.25	0.27	0.30	0.49*	0.00	0.63*	0.58*	0.39	0.18	0.25	0.00	-0.06
Stage III clauses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage III phrases	-0.17	0.09	0.70*	0.32	0.82**	0.69*	0.36	0.13	0.17	0.48*	0.66*	0.49*	0.45*	0.01	-0.18	0.08
Stage IV clauses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage IV phrases	0.57*	0.00	0.47*	0.47*	0.13	0.02	0.08	0.34	-0.21	0.66*	0.40	0.31	0.11	0.34	0.13	-0.04
Agent - action	0.77	-	0.31	0.76	0.99*	-0.40	0.19	0.94	-0.05	0.46	0.83	0.93	-0.98	0.76	0.33	-
Action - object	-0.49	-	-0.88	-0.50	-0.19	0.32	0.99*	0.53	0.97	-0.79	0.64	0.00	0.00	-0.50	-0.87	-
Agent Object	-0.51	-	0.02	-0.50	0.95	0.08	-0.50	-0.99*	-0.28	-0.14	-0.98	-0.87	0.87	-0.50	0.00	-
Modifier - head	-0.49	-	-0.88	-0.50	-0.19	0.82	0.99*	0.53	0.97	-0.79	0.64	0.00	0.00	-0.50	-0.87	-

APPENDIX 23: BSL (Makaton) Group cont.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Action - location	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agent - location	0.87	-	0.48	0.87	-0.98	-0.57	0.00	0.35	-0.24	0.62	0.77	0.99*	-0.99*	0.87	0.50	-
Other 2-term rel.s	0.99*	-	0.86	0.99*	-0.76	-0.90	-0.50	0.47	-0.69	0.93	0.35	0.87	-0.87	0.99*	0.87	-
% 2-term rel.s	-0.14	-	-0.65	-0.16	-0.53	0.56	0.93	0.80	0.82	-0.51	0.87	0.36	-0.36	-0.16	-0.63	-
Exp -state-source	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ag-act-loc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other 3-term rel.s	0.99*	-	0.86	0.99*	-0.76	-0.90	0.60	-0.50	-0.69	0.93	0.35	0.87	-0.37	0.99*	0.87	-
Requests	-0.39	-0.15	0.45*	0.19	0.73**	0.55*	0.08	-0.12	0.01	0.18	0.54*	0.27	0.33	-0.13	-0.41	-0.11
Responses	0.04	-0.11	0.46*	0.79**	0.35	0.40	0.02	0.12	0.01	0.59*	0.44*	0.47*	0.48*	0.41	0.44	0.16
Descriptions	-0.12	-0.30	0.77**	0.21	0.83**	0.54*	0.16	-0.19	-0.88	0.55*	0.45*	0.41	0.33	0.12	-0.08	-0.10
Statements	0.29	0.27	0.09	0.14	-0.07	-0.42	0.34	0.20	0.12	0.39	0.04	-0.07	-0.08	0.10	-0.29	-0.06
Organization devices	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX 24: Syntactic Analysis of Spoken Language Samples - Mean Number of Utterances and Percentage of Total Utterances Scored in the LARSP Categories

	Bliss Users (n = 6)		Makaton Users (n = 14)		Difference bet. groups on % Frequency
	Mean	%	Mean	%	t
LARSP Category					
Stereotypes	0.00	0.00	0.50	0.93	0.64
Ambiguous	0.00	0.00	0.00	0.00	0.00
Minor	2.00	62.83	3.07	35.21	1.67
Stage I					
Command V	0.00	0.00	0.14	1.50	0.89
Question Q	0.00	0.00	0.21	0.79	0.91
Verb	0.50	9.00	0.93	3.57	0.94
Noun	0.67	14.50	4.79	41.79	1.90
Other	0.17	2.83	1.07	7.64	0.81
Stage II - Clauses					
Command + X	0.00	0.00	0.21	0.36	0.93
Question + X	0.00	0.00	0.00	0.00	0.00
Subject + verb	0.17	2.83	0.21	0.36	0.87
Subject+object/complement	0.00	0.00	0.21	0.36	0.64
Negative + X	0.00	0.00	0.07	0.14	0.64
Adverbial + X	0.00	0.00	0.14	0.21	0.64
Verb+object/complement	0.00	0.00	0.21	0.50	0.94
Other clauses	0.00	0.00	0.00	0.00	0.00
Stage II - Phrases					
Determiner + noun	0.33	5.17	0.43	0.71	1.34
Adjective + noun	0.00	0.00	0.21	0.36	0.93
Noun + noun	0.00	0.00	0.14	0.86	0.77
Preposition + noun	0.00	0.00	0.86	1.29	0.64
Verb + verb	0.00	0.00	0.00	0.00	0.00
Verb + particle	0.00	0.00	0.07	0.14	0.64
Intensifier + X	0.00	0.00	0.21	0.36	0.64
Other phrases	0.17	2.83	0.43	0.71	0.73
Stage II - Expansions					
Subject expansions	0.00	0.00	0.07	0.14	0.64
Verb expansions	0.00	0.00	0.00	0.00	0.00
Object/complement expan.s	0.00	0.00	0.00	0.00	0.00
Adverbial expansions	0.00	0.00	0.00	0.00	0.00

APPENDIX 24 cont.

LARSP Category	Bliss Users (n = 6) Mean	%	Makaton Users (n = 14) Mean	%	Difference bet.Groups on % Frequency t
Stage III - Clauses					
Command + X + Y	0.00	0.00	0.07	0.14	0.64
Command let + X + Y	0.00	0.00	0.00	0.00	0.00
Command do + X + Y	0.00	0.00	0.00	0.00	0.00
Question + X + Y	0.00	0.00	0.00	0.00	0.00
Verb-subject inversion	0.00	0.00	0.00	0.00	0.00
Subj.+ verb + obj./comp.	0.00	0.00	0.71	1.07	0.64
Subject+verb+adverbial	0.00	0.00	0.14	0.29	0.95
Negative + X + Y	0.00	0.00	0.00	0.00	0.00
Verb+compl./obj.+adverb	0.00	0.00	0.79	1.21	0.64
Verb+direct obj.+ indir.obj.	0.00	0.00	0.00	0.00	0.00
Other clauses	0.00	0.00	0.00	0.00	0.00
Stage III - Phrases					
Determiner + adj.+ noun	0.00	0.00	0.00	0.00	0.00
Adj. + adj. + noun	0.00	0.00	0.00	0.00	0.00
Preposition + determiner + noun	0.00	0.00	0.00	0.00	0.00
Pronoun	0.17	2.83	2.93	5.43	0.37
Copula	0.00	0.00	0.00	0.00	0.00
Auxiliary verb	0.00	0.00	0.00	0.00	0.00
Other phrases	0.00	0.00	0.07	0.14	0.64
Stage III - Expansions					
Subject expansions	0.00	0.00	0.00	0.00	0.00
Verb expansions	0.00	0.00	0.07	0.14	0.64
Complement expansions	0.00	0.00	0.00	0.00	0.00
Object expansions	0.00	0.00	0.14	0.21	0.64
Adverbial expansions	0.00	0.00	0.79	1.21	0.64
Stage IV - Clauses					
Command + subject	0.00	0.00	0.00	0.00	0.00
Command + X + Y +	0.00	0.00	0.00	0.00	0.00
Question+verb-subj.inversion	0.00	0.00	0.00	0.00	0.00
Question + X + Y +	0.00	0.00	0.00	0.00	0.00
Verb-subj.inversion+X+	0.00	0.00	0.00	0.00	0.00
Tag Question	0.00	0.00	0.00	0.00	0.00
Subj.+verb+obj.+adverb	0.00	0.00	0.14	0.21	0.64
Subject+verb+obj.+obj.	0.00	0.00	0.00	0.00	0.00
Subject + verb + obj.+ compl.	0.00	0.00	0.00	0.00	0.00

APPENDIX 24 cont.

LARSP Category	Bliss Users (n = 6) Mean	%	Makaton Users (n = 14) Mean	%	Difference bet.groups on % Frequency t
Stage IV - Clauses cont.					
Adverbial+adverbial+X+Y	0.00	0.00	0.00	0.00	0.00
Other clauses	0.00	0.00	0.00	0.00	0.00
Stage IV - Phrases					
Noun ph.+prep.+noun ph.	0.00	0.00	0.00	0.00	0.00
Prep.+determ.+adj.+ noun	0.00	0.00	0.00	0.00	0.00
Conjunction + X	0.00	0.00	0.14	0.21	0.64
X + conjunction + X	0.00	0.00	0.07	0.29	0.64
Negative + verb	0.00	0.00	0.00	0.00	0.00
Negative + X	0.00	0.00	0.29	0.50	0.64
2 auxiliary verbs	0.00	0.00	0.00	0.00	0.00
Other phrases	0.00	0.00	0.00	0.00	0.00
Stage V					
Connectivity 'and'	0.00	0.00	0.21	0.36	0.64
Connectivity coord.	0.00	0.00	0.00	0.00	0.00
Connectivity subord.	0.00	0.00	0.00	0.00	0.00
Connectivity other	0.00	0.00	0.00	0.00	0.00
Command coord.	0.00	0.00	0.00	0.00	0.00
Command other	0.00	0.00	0.00	0.00	0.00
Question coord.	0.00	0.00	0.00	0.00	0.00
Question other	0.00	0.00	0.00	0.00	0.00
Coord. clause 1	0.00	0.00	0.00	0.00	0.00
Coord. clause 1 +	0.00	0.00	0.00	0.00	0.00
Subord. clause 1	0.00	0.00	0.00	0.00	0.00
Subord. clause 1 +	0.00	0.00	0.00	0.00	0.00
Comparative	0.00	0.00	0.00	0.00	0.00
Postmodifying clause 1	0.00	0.00	0.00	0.00	0.00
Postmodifying clause 1 +	0.00	0.00	0.00	0.00	0.00
Postmodifying phrase 1 +	0.00	0.00	0.00	0.00	0.00
Inflections					
-ing	0.17	2.33	0.50	0.93	0.78
plural	0.00	0.00	0.14	0.21	0.64
-ed	0.00	0.00	0.00	0.00	0.00
-en	0.00	0.00	0.00	0.00	0.00
3rd person s	0.00	0.00	0.00	0.00	0.00
Genitive	0.00	0.00	0.00	0.00	0.00

APPENDIX 24 cont.

LARSP Category	Bliss Users (n = 6)		Makaton Users (n = 14)		Difference bet. groups on % Frequency
	Mean	%	Mean	%	*t*
Inflections cont.					
n't	0.00	0.00	0.00	0.00	0.00
'copula	0.00	0.00	0.07	0.14	0.64
'auxiliary	0.00	0.00	0.00	0.00	0.00
-est	0.00	0.00	0.00	0.00	0.00
-er	0.00	0.00	0.07	0.14	0.64
-ly	0.00	0.00	0.00	0.00	0.00

APPENDIX 25: Communicative Functions Expressed in the Spoken Language Samples - Mean Number of Utterances and Percentage of Total Utterances Expressing Each Communicative Function

Communicative Function	Bliss Users (n = 6) Mean	%	Makaton Users (n = 14) Mean	%	Difference bet. Groups on % Frequency t
Requests - total	0.00	0.00	0.86	3.57	1.73
Yes/no questions	0.00	0.00	0.00	0.00	0.00
Wh-questions	0.00	0.00	0.21	0.79	0.91
Actions requests	0.00	0.00	0.64	2.79	1.37
Permission requests	0.00	0.00	0.00	0.00	0.00
Rhetorical questions	0.00	0.00	0.00	0.00	0.00
Responses - total	3.67	94.83	5.29	47.93	4.88**
Yes/no answers	1.83	46.17	1.86	22.57	1.50
Wh-answers	1.83	48.67	3.07	17.21	2.06*
Compliances	0.00	0.00	0.29	1.00	0.64
Qualifications	0.00	0.00	0.00	0.00	0.00
Repetitions	0.00	0.00	0.07	7.14	0.64
Descriptions - total	0.17	2.33	7.21	40.00	4.16**
Identifications	0.17	2.33	3.71	29.00	3.12*
Descriptions of events	0.00	0.00	1.71	5.50	1.52
Descriptions of properties	0.00	0.00	0.36	1.00	1.09
Descriptions of locations	0.00	0.00	1.43	4.50	1.22
Descriptions of time	0.00	0.00	0.00	0.00	0.00
Statements - total	0.00	0.00	0.64	2.71	0.95
Rules	0.00	0.00	0.07	1.79	0.64
Evaluations	0.00	0.00	0.14	0.29	0.64
Internal reports	0.00	0.00	0.43	0.64	0.64
Attributions	0.00	0.00	0.00	0.00	0.00
Explanations	0.00	0.00	0.00	0.00	0.00
Organization Devices - total	0.00	0.00	0.71	3.71	0.96
Boundary markers	0.00	0.00	0.57	3.43	0.92
Calls	0.00	0.00	0.00	0.00	0.00
Speaker selections	0.00	0.00	0.00	0.00	0.00
Politeness markers	0.00	0.00	0.00	0.00	0.00
Accompaniments	0.00	0.00	0.14	0.29	0.64
Performatives - total	0.00	0.00	0.36	0.64	0.64
Protests	0.00	0.00	0.36	0.64	0.64
Jokes	0.00	0.00	0.00	0.00	0.00

APPENDIX 25: cont.

Communicative Function	Bliss Users (n = 6) Mean	%	Makaton Users (n = 14) Mean	%	Difference bet. Groups on % Frequency t
Claims	0.00	0.00	0.00	0.00	0.00
Warnings	0.00	0.00	0.00	0.00	0.00
Teases	0.00	0.00	0.00	0.00	0.00
Other Functions	0.00	0.00	0.00	0.00	0.00
Uninterpretable	0.17	2.83	0.36	1.50	0.56

APPENDIX 26: Parents' Views of the Advantages and Disadvantages of Augmentative System Use

	Bliss Group	BSL (Makaton) Group
	(number of parents noting item)	
Advantages		
Provides means of expressive comm. with family	14 (70%)	14 (70%)
Allows for comm. with people outside family	6 (30%)	1 (5%)
Relieves frustration	6 (30%)	6 (30%)
Encourages speech development	0 (0%)	5 (25%)
Aids comprehension	0 (0%)	3 (15%)
Enhances motivation to communicate	0 (0%)	1 (5%)
Promotes eye contact	0 (0%)	1 (5%)
Disadvantages		
Inhibits speech development	6 (30%)	9 (45%)
Comm. restricted to people familiar with system	4 (20%)	5 (25%)
Child not motivated to use the system	4 (20%)	0 (0%)
Cumbersome/slow	5 (25%)	0 (0%)
Physical difficulties in using the system	2 (10%)	1 (5%)
Difficult for family to learn	0 (0%)	1 (5%)
Emphasizes child's handicap	0 (0%)	1 (5%)

APPENDIX 27: Correlates of Child's Motivation to Communicate, Parents' Attitude and Extent of Home Use of Signs/Symbols

	Bliss Users			BSL (Makaton) Users		
	Motiv. to Comm.	Parent Attitude	Extent of home use	Motiv. to comm.	Parent attitude	Extent of home use
Length of time on signs/symbols prior to study	-0.05	0.00	0.60**	0.48*	0.43*	0.68**
Weekly sign/symbol teaching time	-0.19	-0.22	0.29	0.00	0.12	0.15
Degree of physical handicap	-0.01	0.11	0.18	-0.17	-0.12	-0.34*
Columbia interlevel scores	0.35	0.63**	0.19	0.67**	-0.15	0.35*
Pre-symbol Assessment	0.77**	0.36**	0.41*	0.43*	-0.39*	0.01
English Picture Vocabulary Test	0.67**	0.58**	0.31*	0.39*	-0.24	0.09
Reynell Comprehension Scale	0.67**	0.31*	0.44*	0.41*	-0.10	0.10
Reynell Expression Scale	0.06	-0.13	-0.07	0.29	-0.03	0.07
Number of intelligible words	0.23	-0.02	-0.02	0.41*	-0.09	0.11
Motor imitation	0.26	0.27	0.09	0.55*	-0.01	0.19
Verbal imitation	-0.07	-0.23	-0.22	0.40*	-0.01	0.05
Gestural expression	0.41*	0.14	0.10	0.65**	-0.13	0.30*
Gestural comprehension	0.65**	0.52*	0.39*	0.62*	-0.26	0.18
Symbolic Play Test	0.44*	0.32*	0.53*	0.67**	-0.10	0.28
Sign/symbol recording measures						
No. signs/symbols understood	0.47*	0.12	0.65**	0.77**	0.09	0.47*
No. signs/symbols produced	0.45*	0.19	0.56**	0.69**	0.11	0.59**
Total utterances	-0.14	0.07	0.38**	0.57*	-0.25	-0.04
MSLU	0.54*	0.35*	0.29	0.32	-0.43*	-0.08

APPENDIX 27: cont.

	Bliss Users			BSL (Makaton) Users		
	Motiv to comm	Parent Attitude	Extent of home use	Motiv to comm	Parent attitude	Extent of home use
% entries I out of I-V	-0.65^{**}	-0.35^{*}	-0.33^{*}	-0.41	0.50^{*}	0.05
Clauses at Stage II	0.26	0.21	0.44^{*}	0.42	-0.43^{*}	-0.08
Phrases at Stage II	0.10	0.09	0.32	0.28	-0.34	0.10
Clauses at Stage III	0.26	0.19	-0.13	-	-	-
Phrases at Stage III	0.46^{*}	0.33^{*}	0.27	0.60^{*}	-0.52^{*}	-0.05
Clauses at Stage IV	-0.01	-0.31	0.00	-	-	-
Phrases at Stage IV	-0.01	-0.31	0.00	0.15	-0.24	0.07
Requests	0.22	0.05	0.21	0.32	-0.25	0.11
Responses	-0.30	0.04	0.35^{*}	0.51^{*}	-0.03	0.04
Descriptions	-0.15	-0.05	0.17	0.44^{*}	-0.34	-0.01
Statements	0.41^{*}	0.33	0.23	0.11	-0.02	-0.20
Organization devices	0.04	0.20	0.26	-	-	-
Performatives	-	-	-	-	-	-
Speech recording measures						
Total utterances	0.14	-0.50	0.39	-0.04	-0.20	0.05
MLU	0.29	-0.37	0.20	0.36	-0.35	-0.04
Child's motivation to communicate	1.00	0.35^{*}	0.28	1.00	-0.04	0.42^{*}
Extent of sign/symbol use at home	0.28	0.36^{*}	1.00	0.42^{*}	0.39^{*}	1.00

APPENDIX 28: Correlates of Measures of Social Skills, Attending Ability and Behavioural Difficulties

	Bliss Users (n = 20)					BSL (Makaton) Users (n = 20)				
	P-A-C Socializ.	Attention Deficits	Needleman Quest.	Rutter A Scale	Rutter B Scale	P-A-C Socializ.	Attention Deficits	Needleman Quest.	Rutter A Scale	Rutter B Scale
Age	-0.19	0.02	0.02	0.04	0.05	- 0.01	-0.01	-0.11	0.05	-0.03
Degree of physical handicap	-0.37*	-0.18	-0.34*	-0.28	-0.26	-0.52*	0.00	0.06	-0.02	-0.06
Impairment of speech musculature	-0.21	-0.26	-0.19	0.03	-0.19	-0.32*	-0.01	-0.05	0.17	-0.09
Columbia MMS	0.24	-0.28*	-0.32*	-0.04	0.11	0.60*	-0.08	-0.34*	-0.26	-0.15
Pre-symbol Assess	0.32*	-0.35*	-0.51*	-0.17	-0.06	0.21	-0.14	-0.32*	-0.33*	-0.25
EPVT	0.27	-0.32*	-0.61**	-0.22	-0.25	0.48*	-0.07	-0.30*	-0.14	-0.14
Reynell Comprehension	0.23	-0.28*	-0.64**	-0.18	-0.32*	0.41*	-0.14	-0.25	-0.20	-0.10
Reynell Expression	0.27	-0.14	0.17	-0.15	0.20	0.40*	-0.18	-0.16	0.01	0.07
No intelligible words	0.22	-0.32*	0.03	-0.24	0.01	0.52*	-0.04	-0.14	-0.08	0.08
Motor imitation	0.35*	-0.17	0.04	0.15	0.23	0.25	-0.39*	-0.49*	-0.27	-0.24
Verbal imitation	0.08	-0.11	0.29	-0.18	0.09	0.36*	-0.16	-0.02	-0.07	-0.05
Gestural comprehension	0.25	-0.40*	-0.54*	-0.17	-0.18	0.51*	-0.16	-0.46*	-0.24	-0.17
Gestural expression	0.43*	-0.12	-0.03	0.24	0.21	0.52*	0.03	-0.41*	-0.21	-0.02

APPENDIX 28: cont.

	Bliss Users (n = 20)					BSL (Makaton) Users (n = 20)				
	P-A-C Socializ.	Attention Deficits	Needleman Quest.	Rutter A Scale	Rutter B Scale	P-A-C Socializ.	Attention Deficits	Needleman Quest.	Rutter A Scale	Rutter B Scale
Symbolic Play Test	-0.05	-0.22	-0.44*	0.01	-0.25	0.21	-0.20	-0.37*	-0.40*	-0.11
No.signs/symbols exp.	-0.02	-0.19	-0.42*	-0.32*	-0.24	0.52*	-0.10	-0.35*	-0.21	-0.04
No.signs/symbols comp.	-0.05	-0.19	-0.34*	-0.27	-0.18	0.56*	-0.09	-0.35*	-0.19	-0.02
Symbol/sign Recording Total utterances	0.24	-0.13	-0.06	0.03	0.30*	0.17	-0.11	-0.27	0.04	0.08
MSLU	0.34*	-0.47*	-0.21	-0.20	0.17	0.24	-0.08	-0.38*	-0.03	0.33
Clauses at Stage II	0.14	-0.41*	-0.27	-0.37*	0.01	0.21	-0.05	-0.33	0.00	0.36
Phrases at Stage II	0.22	-0.13	-0.04	-0.08	0.34*	0.35	-0.25	-0.30	0.04	0.18
Clauses at Stage III	0.34*	-0.18	0.04	0.01	0.35*	-	-	-	-	-
Phrases at Stage III	0.46*	-0.55*	-0.24	-0.12	0.13	0.18	0.02	-0.19	0.01	0.24
Requests	0.43*	-0.16	-0.15	-0.20	0.06	0.00	0.33	-0.12	-0.04	0.46*
Responses	-0.01	0.05	-0.03	0.10	0.17	0.09	-0.32	-0.21	0.00	-0.15
Descriptions	-0.01	-0.15	0.11	0.11	-0.37*	0.25	-0.04	-0.20	0.04	0.16

APPENDIX 28: cont.

	Bliss Users (n = 20)					BSL (Makaton) Users (n = 20)				
	P-A-C Socializ.	Attention Deficits	Needleman Quest.	Rutter A Scale	Rutter B Scale	P-A-C Socializ.	Attention Deficits	Needleman Quest.	Rutter A Scale	Rutter B Scale
Statements	0.49^{*}	-0.54^{*}	-0.27	-0.33^{*}	0.08	0.33	-0.20	-0.10	-0.26	-0.26
Organization Devices	0.07	0.09	0.18	0.33^{*}	0.31	-	-	-	-	-
Performatives	-	-	-	-	-	-	-	-	-	-
Speech Recording Total utterances	0.00	0.00	-0.28	-0.93^{*}	-0.41	0.37^{*}	0.17	0.04	-0.29	-0.14
MLU	-0.45	-0.36	-0.18	-0.56	-0.45	0.10	0.13	-0.10	-0.21	0.39^{*}
Motivation to comm	0.47^{*}	-0.51^{*}	-0.61^{*}	-0.25	-0.25	0.53^{*}	-0.20	-0.34^{*}	-0.13	-0.02
Understood by teachers	0.28	-0.36^{*}	-0.35^{*}	-0.14	-0.01	0.41^{*}	0.05	-0.42^{*}	-0.28	-0.13
Understood by parents	0.18	-0.52^{*}	-0.50^{*}	-0.34^{*}	-0.16	0.44^{*}	-0.03	-0.24	-0.32^{*}	-0.04
Mnths in programme	-0.09	-0.01	-0.11	-0.03	-0.01	0.31^{*}	-0.05	-0.01	0.03	0.06
Age at which programme beg.	-0.19	0.06	0.07	0.05	0.05	-0.24	-0.04	-0.03	0.10	0.01
Weekly teaching time	-0.30^{*}	-0.08	0.09	-0.18	-0.08	-0.02	-0.25	-0.15	-0.13	-0.13
Extent of sign/symbol use at school	-0.08	0.16	-0.04	0.01	0.03	0.27	-0.06	-0.03	-0.22	0.05
Extent of sign/symbol use at home	-0.01	-0.31^{*}	-0.36^{*}	-0.16	-0.13	0.42^{*}	-0.11	-0.18	-0.11	0.01
Parent attitude to system	0.08	-0.06	-0.25	0.01	-0.09	-0.07	0.00	0.09	0.12	0.06

APPENDIX 29: Differences Between the Readers and Non-readers in the Bliss Users Group

	Readers (n = 4)		Non - Readers (n = 16)		
	Mean	S.D.	Mean	S.D.	t
Age	74.25	6.95	71.56	18.32	0.28
Columbia Interlevel Scale	294.00	33.62	243.19	28.10	3.12*
Pre-Symbol Assessment	29.25	2.22	21.63	5.46	2.69*
English Picture Vocab. Test	38.75	3.30	11.50	10.04	5.26**
Reynell Comprehension Scale	59.00	1.83	43.44	7.97	7.10**
Reynell Expression Scale	7.75	6.95	8.00	6.53	0.07
Motor imitation	5.25	2.63	4.81	2.69	0.29
Verbal imitation	1.00	2.00	2.13	4.10	0.53
Gestural expression	19.75	8.81	20.31	7.72	0.13
Gestural comprehension	16.00	0.00	12.75	3.89	1.64
Symbolic Play Test	23.50	0.58	20.63	4.76	2.35*
No. symbols understood	117.75	49.56	38.06	31.46	4.06**
No. symbols produced	109.75	46.89	35.81	27.00	4.24**
Symbol Recording					
Total utterances	12.50	6.25	12.88	10.46	0.07
MSLU	1.63	0.12	1.38	0.47	1.85
Requests	2.50	2.65	1.31	2.18	0.94
Responses	7.50	4.04	6.94	5.88	0.18
Descriptions	1.50	1.73	3.81	4.54	0.99
Statements	1.00	0.82	0.31	0.79	1.54
Organization devices	0.00	0.00	0.06	0.25	0.49
Performatives	0.00	0.00	0.00	0.00	0.00
Speech Recording					
Total utterances	5.00	0.00	3.80	2.59	0.42
MLU	1.00	0.00	1.16	0.23	0.63
Motivation to communicate	26.25	3.30	19.94	5.11	2.33*
P-A-C Socialization Scale	13.50	3.42	11.88	4.05	0.74
Rutter Teacher Questionnaire	2.75	1.71	5.88	3.36	1.78
Rutter Parent Questionnaire	6.50	2.38	11.50	3.14	2.95*
Needleman Questionnaire	1.25	0.96	5.38	1.31	5.86*
Observation of attentional be.	8.75	4.86	16.81	8.10	1.88
Mnths on Bliss pre study	16.25	2.22	9.50	5.33	2.44*
Weekly teaching time	97.50	19.37	111.56	57.73	0.47

APPENDIX 29: Cont.

Differences between the readers and non-readers on ordinal scale variables:

Variable	X^2	d.f.
Social class	6.88	5
Severity of physical handicap	2.69	2
Impairment of speech musculature	1.10	2
No. intelligible words	1.64	3
Degree of intelligibility	1.64	3

APPENDIX 30: Semantic Relations in the Symbol and Sign Language Samples Over Time - Percentage of Total Utterances Expressing Each Semantic Relation

Semantic Relation	Occasion	Bliss Users (n = 19)		BSL (Makaton) Users (n = 10)	
Two-term Relations		Mean	S.D.	Mean	S.D.
Agent-action	1	4.16	5.50	1.80	5.69
	2	3.00	5.53	0.20	0.63
	3	2.74	3.71	0.80	1.40
	4	5.68	6.78	2.20	2.44
Action-object	1	0.42	1.84	0.00	0.00
	2	2.11	4.53	0.40	1.27
	3	1.63	3.50	0.70	1.64
	4	2.00	4.18	0.20	0.63
Agent-object	1	2.42	5.31	0.00	0.00
	2	1.58	3.79	1.70	4.17
	3	3.37	6.75	0.60	1.35
	4	3.05	4.37	0.50	1.58
Modifier-head	1	0.32	1.38	0.00	0.00
	2	1.63	4.36	0.20	0.63
	3	3.21	4.67	0.00	0.00
	4	3.26	6.45	0.40	0.84
Negation-X	1	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00
	3	0.26	1.15	0.00	0.00
	4	0.47	2.07	0.00	0.00
Action-location	1	1.89	3.78	0.00	0.00
	2	0.58	1.81	0.20	0.63
	3	2.63	6.28	0.00	0.00
	4	1.37	2.69	0.40	1.27
Agent/object-location	1	1.74	4.28	0.90	2.85
	2	0.90	2.16	0.00	0.00
	3	5.74	5.72	1.20	2.15
	4	7.21	8.03	3.20	5.01
Introducer-X	1	0.00	0.00	0.00	0.00
	2	0.53	1.58	0.00	0.00
	3	0.26	1.15	0.00	0.00
	4	0.32	1.38	0.00	0.00

APPENDIX 30: cont.

	Occasion	Bliss Users (n = 19) Mean	Bliss Users (n = 19) S.D.	BSL (Makaton) Users (n = 10) Mean	BSL (Makaton) Users (n = 10) S.D.
Three-term Relations					
Agent-action-object	1	0.00	0.00	0.00	0.00
	2	0.84	2.06	0.00	0.00
	3	0.47	1.43	0.20	0.63
	4	1.47	4.30	0.20	0.63
Experiencer-state-source	1	2.05	5.17	0.00	0.00
	2	1.79	6.14	0.00	0.00
	3	0.95	3.29	0.00	0.00
	4	0.42	1.84	0.00	0.00
Introducer-modifier-head	1	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00
Agent-action-location	1	1.47	4.85	0.00	0.00
	2	0.90	2.16	0.00	0.00
	3	0.47	2.07	0.20	0.63
	4	0.58	1.74	0.20	0.63
Action-modifier-head	1	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00
Other three-term relations	1	5.53	10.38	0.90	2.85
	2	5.05	8.25	0.20	0.63
	3	4.26	5.84	0.20	0.63
	4	4.63	7.11	0.60	1.35
Four-term Relations					
Agent-action-object-location	1	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00
	4	0.26	0.15	0.00	0.00
Other four-term relations	1	0.16	0.69	0.98	2.85
	2	1.90	4.65	0.00	0.00
	3	0.95	1.93	0.40	0.84
	4	2.32	3.50	1.10	2.85

APPENDIX 31: Teachers' and Parents' Descriptions of the Children's Communicative Abilities Over Time

Motivation to Communicate - total score

	Bliss Group (n = 20)		BSL (Makaton) Group (n = 14)	
Occasion	Mean	S.D.	Mean	S.D.
1	21.20	5.39	19.57	6.01
2	23.05	5.46	20.71	6.72
3	25.15	4.37	23.93	6.15
4	26.30	4.41	25.36	5.24

Use of Symbols/Signs to Answer Questions

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	0	0	0	0	35.7	28.6	21.4	7.1
Occasionally	50	25	20	20	50	50.0	35.7	50.0
Reliably	50	75	80	80	14.3	21.4	42.9	42.9

Use of Symbols/Signs to Ask for Objects

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	35	15	10	20	28.6	14.3	28.6	21.4
Occasionally	60	85	80	50	64.3	71.4	57.1	57.1
Reliably	5	0	10	30	7.1	14.3	14.3	21.4

Use of Symbols/Signs to Indicate Needs

	Bliss Group (n = 20)				BSL (Makaton Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	40	20	25	25	35.7	28.6	21.4	28.6
Occasionally	55	75	65	40	57.1	57.1	57.1	42.9
Reliably	5	5	10	35	7.1	14.3	21.4	28.6

APPENDIX 31: cont.

Use of Symbols/Signs to Engage in Conversations

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	50	25	15	5	57.1	42.9	35.7	35.7
Occasionally	50	70	60	50	42.9	57.1	50.0	42.9
Reliably	0	5	25	45	0.0	0.0	14.3	21.4

Communication with Speech Therapist/Class Teacher

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	0	0	0	0	0.0	0.0	0.0	0.0
Occasionally	20	15	0	5	42.9	21.4	21.4	21.4
Usually	80	85	100	95	57.1	78.6	78.6	78.6

Communication with Other Teachers

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	5	0	0	5	28.6	14.3	7.1	7.1
Occasionally	75	70	55	40	64.3	71.4	50.0	35.7
Usually	20	30	45	55	7.1	14.3	42.9	57.1

Communication with Peers

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	5	5	0	0	35.7	14.3	7.1	14.3
Occasionally	85	55	45	40	42.9	42.9	35.7	21.4
Usually	10	40	55	60	21.4	42.9	57.1	64.3

APPENDIX 31: cont.

Communication with Strangers

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	40	15	15	15	50.0	28.6	21.4	7.1
Occasionally	45	60	45	35	50.0	71.4	57.1	42.9
Usually	15	25	40	50	0.0	0.0	21.4	50.0

Communication with Parents

	Bliss Group (n = 20)				BSL (Makaton) Group (n = 14)			
	Occasions				Occasions			
	1	2	3	4	1	2	3	4
	%	%	%	%	%	%	%	%
Never	0	0	0	0	0.0	0.0	0.0	0.0
Occasionally	10	10	5	0	0.0	0.0	0.0	0.0
Usually	90	90	95	100	100.0	100.0	100.0	100.0

APPENDIX 32: Correlations Between the Linear Trends on the Measures of Spoken Language and Acquisition and Use of Signs/Symbols

i) The Bliss Group (n = 19):

	Reynell Expressive Scale	No.Spoken Utt.s Produced	MLU
No. symbols understood	0.08	0.22	0.18
No. symbols produced	0.05	0.23	0.20
Extent of Bliss use at school	0.14	0.11	0.04
Extent of Bliss use at home	-0.06	0.01	0.18
No. symbol utt.s produced	0.42*	0.32*	0.13
MSLU	0.14	0.01	0.07

ii) The BSL (Makaton) Group (n = 14):

	Reynell Expressive Scale	No.Spoken Utt.s Produced	MLU
No. signs understood	0.03	-0.09	0.06
No. signs produced	0.10	0.11	0.08
Extent of sign use at school	-0.20	-0.23	-0.07
Extent of sign use at home	-0.19	-0.14	-0.19
No. sign utt.s produced	-0.18	-0.23	-0.16
MSLU	-0.46*	-0.51*	-0.32

APPENDIX 33: Means and Standard Deviations for the Sign/Symbol and Spoken Language Samples in the Bliss and BSL (Makaton) Groups

	Bliss Group (n = 7)		BSL (Makaton) Group (n = 10)	
	Bliss	Speech	Makaton	Speech
Total utterances	27.00± 8.54	11.86± 8.73	26.40±13.40	23.20±24.99
No. spontaneous utt.s	10.29± 6.37	2.00± 3.70	11.70± 9.21	9.00±11.60
% spontaneous utt.s	35.71±15.34	8.71±13.65	43.60±22.18	29.10±24.10
No. response utt.s	16.71± 4.92	9.86± 5.46	14.70± 8.72	14.20±13.81
% response utt.s	64.29±15.34	91.29±13.65	56.40±22.18	70.90±24.10
% 1-term utt.s	58.43±23.84	83.14±25.54	91.90±10.64	91.30±14.04
% multi-term utt.s	41.57±23.84	16.86±25.54	7.50±10.94	8.70±14.04
MSLU-MLU	1.70± 0.57	1.36± 0.59	1.11± 0.14	1.15± 0.23
% Stage I entries out of Stages I-V	53.43±26.83	77.86±30.29	87.90±17.21	86.50±18.78
Stage II clauses	6.57± 3.51	0.57± 1.13	1.90± 2.13	1.60± 3.34
Stage II phrases	4.43± 4.04	1.14± 1.46	0.40± 0.97	1.70± 3.09
Stage III clauses	1.29± 2.22	0.71± 1.25	0.20± 0.63	0.60± 1.58
Stage III phrases	2.57± 4.65	1.43± 2.70	1.10± 2.18	2.50± 4.60
Stage IV clauses	0.57± 1.13	0.00± 0.00	0.00± 0.00	0.20± 0.63
Stage IV phrases	1.14± 1.35	0.14± 0.38	0.20± 0.42	0.10± 0.32
Requests	0.57± 0.98	0.71± 1.89	0.90± 2.51	3.50± 7.78
Responses	16.29± 3.35	9.86± 5.46	14.60± 8.70	13.70±12.52
Descriptions	8.43± 6.29	0.43± 0.54	9.50± 9.14	3.80± 4.52
Statements	1.14± 2.19	0.29± 0.76	0.30± 0.95	0.50± 0.71
Organization devices	0.14± 0.38	0.14± 0.38	0.00± 0.00	1.50± 2.07
Performatives	0.00±0.00	0.14± 0.38	0.00± 0.00	0.10± 0.32

APPENDIX 33: cont.

Comparison Between the Symbol/Sign - Speech Difference Scores of the Bliss and BSL (Makaton) groups:

Symbol/Sign-speech difference scores	Bliss Group (n = 7) Mean	S.D.	BSL (Makaton) Group (n = 10) Mean	S.D.	t
Total utterances	15.14	12.80	3.20	25.25	1.15
No. spontaneous utt.s	8.29	7.87	2.70	14.14	0.94
% spontaneous utt.s	27.00	20.70	14.50	33.14	0.88
No. response utt.s	6.86	6.91	0.50	14.78	1.05
% response utt.s	-27.00	20.70	-14.50	13.14	0.88
% 1-term utt.s	-24.71	26.02	0.60	12.51	2.39*
% multi-term utt.s	24.71	26.02	- 1.20	12.93	2.73*
MSLU-MLU	0.34	0.47	- 0.04	0.19	2.32*
% Stage I entries out of entries I - V	-24.43	29.13	1.40	25.44	1.94
Stage II clauses	6.00	3.65	0.30	3.65	3.17*
Stage II phrases	3.29	3.64	- 1.30	2.45	3.12*
Stage III clauses	0.57	1.62	- 0.40	1.78	1.15
Stage III phrases	1.14	2.48	- 1.40	5.54	1.13
Stage IV clauses	0.57	1.13	- 0.20	0.63	1.80
Stage IV phrases	1.00	1.41	0.10	0.57	1.60
Requests	- 0.14	1.46	- 2.60	8.59	0.89
Responses	6.43	6.11	0.90	13.80	0.99
Descriptions	8.00	6.16	5.70	8.31	0.62
Statements	0.86	1.46	- 0.20	1.32	1.56
Organization devices	0.00	0.58	- 1.50	2.07	2.19*
Performatives	- 0.14	0.38	- 0.10	0.32	0.25

APPENDIX 34: Correlations Between the Linear Trends on the Measures of Socialization, Attending Ability and Classroom Behaviour, and the Acquisition and Use of Symbols and Signs

i) The Bliss Group:

	Socialization Scale	Attentional Deficits	Needleman Questionnaire
No. of symbols understood	0.10	0.19	0.01
No. of symbols produced	0.12	0.18	-0.05
Extent of comm. with teacher	-0.19	0.03	0.06
Extent of Bliss use at school	-0.23	0.22	-0.22
No. of symbol utts. produced	0.28*	-0.13	-0.41*
MSLU	0.20	-0.01	0.02

ii) The BSL (Makaton) Group:

	Socialization Scale	Attentional Deficits	Needleman Questionnaire
No. of signs understood	0.23	-0.17	-0.08
No. of signs produced	0.20	-0.06	0.08
Extent of comm. with teacher	0.39*	0.09	-0.39
Extent of sign use at school	0.43*	-0.13	-0.05
No. of sign utt.s produced	0.22	-0.07	-0.02
MSLU	0.36*	-0.17	0.04

APPENDIX 35: The Bliss Group - Comparisons Between the Children who were Reading at Follow-up III and the Non-Readers

	Readers (n = 9)		Non-Readers (n = 11)		
	Mean	S.D.	Mean	S.D.	t
Age at baseline	76.56	11.52	68.46	19.53	1.10
Columbia MMS Scale	272.11	33.38	238.00	29.70	2.42*
Pre-symbol Assessment I+	25.44	5.53	21.27	5.64	1.66
Pre-symbol Assessment III++	29.22	3.15	26.46	3.45	1.86
English Picture Vocab. Test I	26.33	14.42	9.27	9.03	3.23*
English Picture Vocab. Test III	33.11	15.24	19.27	10.01	2.44*
Reynell Comprehension Scale I	51.22	8.33	42.73	9.08	2.16*
Reynell Comprehension Scale III	56.67	5.03	49.09	6.40	2.89*
Reynell Expression Scale I	8.11	7.20	7.82	6.08	0.10
Reynell Expression Scale III	9.67	10.63	9.73	8.70	0.01
Motor Imitation I	5.67	2.65	4.27	2.53	1.20
Motor Imitation III	7.22	3.19	6.64	2.69	0.45
Verbal Imitation I	1.22	1.86	2.46	4.82	0.78
Verbal Imitation III	2.67	3.04	2.82	4.09	0.09
Gestural Expression I	21.67	7.75	19.00	7.82	0.76
Gestural Expression III	26.22	6.96	27.18	4.96	0.36
Gestural Comprehension I	15.22	1.99	11.91	4.18	2.33*
Gestural Comprehension III	15.56	0.73	14.73	1.42	1.58
Symbolic Play Test I	23.11	1.05	19.64	5.46	2.06
Symbolic Play Test III	22.89	1.54	21.55	2.81	1.28
No. of symbols understood I	78.22	56.09	34.18	27.87	2.19*
No. of symbols understood III	155.00	80.98	79.82	37.41	2.57*
No. of symbols produced I	73.22	50.95	32.09	24.26	2.22*
No. of symbols produced III	148.89	81.66	76.27	36.65	2.47*
Symbol Recording					
Total utterances I	10.56	5.23	14.64	11.96	1.01
Total utterances III	18.44	9.28	23.46	8.29	1.28
MSLU I	1.59	0.42	1.30	0.41	1.52
MSLU III	1.84	0.50	1.53	0.31	1.67
Requests I	1.56	1.94	1.55	2.58	0.01
Requests III	0.33	0.71	1.55	2.38	1.60
Responses I	6.22	3.19	7.73	6.90	0.64
Responses III	11.33	6.71	14.18	5.23	1.07

+ I : assessment at baseline

++ III: assessment at Follow-up III

APPENDIX 35: cont.

	Readers (n = 9)		Non-Readers (n = 11)		
	Mean	S.D.	Mean	S.D.	t
Descriptions I	1.89	2.03	4.55	5.17	1.56
Descriptions III	4.56	3.17	6.36	5.43	0.88
Statements I	0.56	0.73	0.36	0.92	0.51
Statements III	1.56	2.24	0.73	1.10	1.01
Organization devices I	0.11	0.33	0.00	0.00	1.11
Organization devices III	0.11	0.33	0.00	0.00	1.11
Performatives I	0.00	0.00	0.00	0.00	0.00
Performatives III	0.00	0.00	0.00	0.00	0.00
Speech Recording					
Total utterances I	4.00	2.65	4.00	2.65	0.00
Total utterances III	17.33	11.02	7.75	4.35	1.62
MLU I	1.17	0.29	1.10	0.17	0.37
MLU III	1.62	0.87	1.17	0.28	1.00
Motivation to communicate I	23.22	5.85	19.55	4.59	1.58
Motivation to communicate III	26.33	5.98	26.27	2.90	0.03
P-A-C Socialization Scale I	12.22	3.80	12.18	4.17	0.02
P-A-C Socialization Scale III	15.44	4.07	15.00	3.16	0.28
Rutter Teacher Questionnaire I	4.56	3.64	5.82	3.09	0.84
Rutter Teacher Questionnaire III	4.11	5.37	4.82	4.12	0.33
Rutter Parent Questionnaire I	9.67	4.24	11.18	2.99	0.94
Rutter Parent Questionnaire III	10.67	3.67	10.36	3.23	0.20
Needleman Questionnaire I	3.56	2.35	5.36	1.50	2.11*
Needleman Questionnaire III	2.89	2.03	3.46	1.86	0.65
Observation of attending ability I	11.33	6.33	18.36	8.36	2.10*
Observation of attending ability III	8.67	7.07	12.20	7.15	1.08
Months on Bliss pre-study	12.67	5.45	9.36	5.43	1.35
Weekly teaching time I	114.44	50.65	104.09	55.40	0.43
Weekly teaching time III	96.67	53.62	96.36	40.32	0.01

Differences between the readers and non-readers on ordinal scale variables:

Variable	χ^2	d.f.
Social class	6.67	5
Degree of physical handicap	3.58	2
Impairment of speech musculature	3.45	2
Degree of intelligibility I	4.85	3
Degree of intelligibility III	1.73	3

APPENDIX 36: Correlations Between the Outcome Measures of Symbol/Sign Acquisition and Use, and the Baseline Measures

	Bliss Users (n = 20)				BSL (Makaton) Users (n = 14)			
	Outcome Measures				Outcome Measures			
Baseline Measures	Symbols Understood	Symbols Produced	Total Utt.s	MSLU	Signs Understood	Signs Produced	Total Utt.s	MSLU
Columbia MMS	0.52*	0.53*	-0.28	0.56*	0.68*	0.62*	0.63*	0.61*
Pre-symbol Assessment	0.68**	0.68**	-0.14	0.62*	0.65*	0.61*	0.72*	0.62*
Frostig - Form Perception	0.46*	0.46*	-0.43*	0.43*	0.89**	0.86**	0.63*	0.56*
Frostig - Position in Space	0.49*	0.47*	0.12	0.47*	0.67*	0.62*	0.78**	0.67*
Severity of physical handicap	0.07	0.09	-0.65**	-0.04	-0.48*	-0.41	-0.55*	-0.37
Mobility Scale	0.16	0.14	0.79**	0.22	0.73**	0.68*	0.68*	0.49*
Agility Scale	-0.02	-0.02	0.76**	0.12	0.75**	0.72*	0.73*	0.54*
Impairment of speech musc.	0.31	0.29	-0.42*	0.24	0.02	0.01	0.20	0.49*
Feeding difficulties	0.19	0.17	-0.32	0.19	0.32	0.39	0.48*	0.36
Reynell Comprehension	0.56*	0.56*	-0.43*	0.48*	0.49*	0.39	0.37	0.18
English Picture Vocab.	0.75**	0.76**	-0.34	0.63**	0.49*	0.44	0.39	0.28
Symbolic Play Test	0.20	0.19	-0.43*	0.19	0.73**	0.70*	0.53*	0.39
Gestural Comprehension	0.33	0.31	-0.18	0.31	0.70*	0.64*	0.56*	0.48*
Gestural Expression	0.18	0.16	0.32	0.18	0.79**	0.75**	0.57*	0.45
Motor imitation	0.32	0.31	0.50*	0.45*	0.70*	0.70*	0.62*	0.36
Reynell Expression Scale	0.29	0.30	0.59*	0.40*	0.08	0.07	-0.28	-0.54*
No. intelligible words	0.30	0.30	0.61*	0.35	0.12	0.11	-0.26	-0.52*
Verbal imitation	0.15	0.16	0.58*	0.11	-0.12	-0.11	-0.42	-0.61*

APPENDIX 36: Cont.

	Bliss Users (n = 20)				BSL (Makaton) Users (n = 14)			
	Outcome Measures				Outcome Measures			
Baseline Measures	Symbols Understood	Symbols Produced	Total Utt.s	MSLU	Signs Understood	Signs Produced	Total Utt.s	MSLU
Dev. of sounds - total	0.12	0.13	0.67**	0.27	0.13	0.14	-0.26	-0.52*
Total spoken utt.s	0.14	0.13	0.38*	0.01	-0.04	-0.04	-0.37	-0.64*
MLU of spoken utt.s	0.08	0.08	0.38*	0.05	-0.26	-0.25	-0.50*	-0.43
Motivation to communicate	0.60*	0.59*	0.04	0.57*	0.63*	0.58*	0.18	0.16
Symbols/signs understood	0.58*	0.57*	-0.15	0.28	0.80**	0.77**	0.50*	0.29
Symbols/signs produced	0.55*	0.55*	-0.16	0.27	0.78**	0.77**	0.44	0.31
Total symbol/sign utt.s	0.01	0.02	0.41*	0.09	0.78**	0.75**	0.58*	0.57*
MSLU	0.59*	0.58*	0.36	0.70**	0.56*	0.54*	0.34	0.14
No. symbol/sign multi-term utt.s	0.43*	0.43*	0.50*	0.46*	0.37	0.36	0.39	0.27
No. symbol/sign spontaneous utt.s	0.08	0.08	0.52*	0.19	0.70*	0.66*	0.62*	0.61*
Months on Bliss/Makaton pre-study	0.20	0.18	-0.16	-0.06	0.45	0.39	0.10	0.22
Age when Bliss/Makaton teaching began	0.11	0.08	-0.01	0.04	-0.12	-0.10	0.07	0.04
Weekly teaching time	-0.01	-0.05	0.02	-0.23	0.34	0.31	0.20	0.27
Additional weekly speech therapy time	-0.05	-0.07	0.07	-0.01	0.37	0.32	0.46*	0.60*
Extent of exposure to symbols/ signs at school	-0.25	0.27	-0.24	0.38*	0.36	0.33	0.14	-0.01
Parent attitude to symbol/ sign use	0.37	0.37	0.38*	0.44*	-0.05	-0.08	-0.17	-0.25

APPENDIX 36: cont.

Baseline Measures	Bliss Users (n = 20) Outcome Measures: Symbols Understood	Symbols Produced	Total Utt.s	MSLU	BSL (Makaton) Group (n = 14) Outcome Measures: Signs Understood	Signs Produced	Total Utt.s	MSLU
Extent of exposure to symbols/ signs at home	0.46*	0.44*	-0.02	0.28	0.54*	0.52*	0.12	0.26
Age	0.17	0.14	-0.07	0.02	0.00	0.01	0.10	0.10
Social class	-0.19	-0.19	0.07	-0.09	-0.10	-0.11	0.09	-0.12
No. of siblings	0.07	0.04	0.06	-0.06	0.40	0.40	0.27	0.48*
P-A-C Socialization Scale	0.37	0.36	0.30	0.42	0.61*	0.54*	0.32	0.13
Rutter Teacher Questionnaire	-0.16	-0.17	0.65**	0.07	-0.11	-0.15	0.01	0.07
Rutter Parent Questionnaire	-0.48*	-0.51*	0.25	-0.17	-0.27	-0.27	-0.28	0.00
Needleman Questionnaire	-0.62*	-0.63**	0.49*	-0.45*	-0.41	-0.42	-0.35	-0.28
Observation of attentional be.	-0.56*	-0.57*	0.03	-0.53*	-0.03	-0.07	0.01	-0.03
Extent understood by teachers	0.44*	0.42*	0.04	0.47*	0.44	0.39	0.16	-0.06
Extent understood by parents	0.65**	0.65**	-0.16	0.59*	0.30	0.33	0.08	0.07
Use of signs/symbols to answer questions	0.64**	0.65**	0.13	0.71**	0.60*	0.63*	0.22	0.18
Use of signs/symbols to ask for objects	0.49*	0.47*	-0.41*	0.45*	0.45*	0.40	-0.29	0.02
Use of signs/symbols to indicate needs	-0.01	-0.01	-0.29	0.09	0.55*	0.50*	0.16	0.37
Use of signs/symbols in spontaneous conversations	0.58*	0.57*	-0.32	0.62*	0.42	0.35	0.06	0.20

APPENDIX 36: cont.

Baseline Measures	Bliss Users (n = 20)				BSL (Makaton) Users (n = 14)			
	Outcome Measures				Outcome Measures			
	Symbols Understood	Symbols Produced	Total Utt.s	MSLU	Signs Understood	Signs Produced	Total Utt.s	MSLU
Use of signs/symbols to comm. with teachers	0.73**	0.74**	-0.16	0.49*	0.55*	0.51*	0.12	0.04
Use of signs/symbols to comm. with parents	0.42*	0.41*	-0.03	0.24	0.49*	0.48*	0.14	0.17
Use of signs/symbols to comm. with peers	0.10	0.14	-0.05	0.22	0.55*	0.62*	0.15	0.38

APPENDIX 37: Correlations Between the Outcome Measures of School and Home Support for Augmentative Communication and the Baseline Measures

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 14)		
	Outcome Measures			Outcome Measures		
Baseline Measures	Extent of School Use	Extent of Home Use	Parent Attitude	Extent of School Use	Extent of Home Use	Parent Attitude
Columbia MMS	-0.10	0.15	-0.01	0.14	0.46*	0.00
Pre-symbol Assessment	0.16	0.37	0.01	0.45	0.40	-0.10
Frostig - Form Perception	0.22	0.62*	0.29	0.41	0.56*	0.07
Frostig - Position in Space	-0.20	0.20	-0.19	0.44	0.48*	0.02
Severity of Physical Handicap	0.09	0.29	0.48*	-0.33	-0.40	-0.26
Mobility Scale	-0.11	-0.18	-0.42*	0.55*	0.65*	0.36
Agility Scale	-0.25	-0.14	-0.35	0.67*	0.64*	0.32
Impairment of speech musc.	0.28	0.57*	0.21	-0.06	0.58*	0.35
Feeding difficulties	-0.09	0.11	-0.05	0.38	0.47*	0.23
Reynell Comprehension	0.22	0.68*	0.43*	0.10	0.16	-0.02
English Picture Vocab.	0.04	0.40*	0.08	-0.09	0.36	0.14
Symbolic Play Test	0.24	0.42*	0.38*	0.49*	0.24	-0.22
Gestural Comprehension	0.27	0.43*	0.26	0.24	0.51*	0.12
Gestural Expression	-0.06	0.17	0.07	0.26	0.49*	0.07
Motor imitation	-0.30	0.01	-0.08	0.21	0.53*	0.32
Reynell Expression Scale	0.09	-0.07	-0.03	-0.42	-0.41	0.04
No. intelligible words	0.16	-0.23	-0.18	-0.44	-0.37	0.02
Verbal imitation	-0.07	-0.44*	-0.33	-0.40	-0.59*	-0.04
Dev. of sounds - total	0.13	-0.18	-0.19	-0.02	-0.31	0.01

APPENDIX 37: cont.

Baseline Measures	Bliss Users (n = 20)			BSL (Makaton) Users (n = 14)		
	Outcome Measures			Outcome Measures		
	Extent of School Use	Extent of Home Use	Parent Attitude	Extent of School Use	Extent of Home Use	Parent Attitude
Total spoken utt.s	0.05	-0.23	-0.12	-0.12	-0.46*	0.12
MLU of spoken utt.s	0.16	-0.17	0.04	-0.31	-0.40	-0.11
Motivation to communicate	0.32	0.42*	0.15	0.10	0.04	-0.22
Symbols/signs understood	-0.02	0.17	-0.33	0.30	0.42	0.21
Symbols/signs produced	-0.02	0.14	-0.32	0.29	0.38	0.03
Total symbol/sign utt.s	-0.09	0.15	0.02	0.24	0.43	0.03
MSLU	0.30	0.13	-0.06	-0.06	0.12	-0.10
No. symbol/sign multi-term utt.s	0.06	0.01	-0.20	-0.17	0.34	0.10
No. symbol/sign spont. utt.s	0.05	0.04	-0.08	0.05	0.48*	0.03
Months on Bliss/Makaton pre-study	-0.03	0.39*	-0.10	0.17	0.24	0.08
Age when Bliss/Makaton teaching began	0.28	-0.14	-0.24	-0.29	0.27	0.29
Weekly teaching time	0.29	-0.02	-0.26	0.35	0.18	-0.10
Additional weekly speech therapy	-0.44*	0.06	-0.08	-0.06	0.47*	0.03
Extent of exposure to symbols/signs at school	0.30	0.15	0.10	0.36	-0.01	-0.03
Parent attitude to symbol/sign use	-0.13	0.04	0.10	0.25	0.17	0.61*
Extent of exposure to symbols/signs at home	0.12	0.62*	-0.07	0.22	0.23	-0.16
Age	0.25	0.01	-0.25	-0.23	0.34	0.32
Social class	-0.52*	0.05	-0.02	0.31	0.09	0.29
No. of siblings	-0.27	-0.22	-0.61*	0.16	0.56*	-0.05

APPENDIX 37: cont.

Baseline Measures	Bliss Users (n = 20) Outcome Measures			BSL (Makaton) Users (n = 14) Outcome Measures		
	Extent of School Use	Extent of Home Use	Parent Attitude	Extent of School Use	Extent of Home Use	Parent Attitude
P-A-C Socialization Scale	0.04	0.18	0.06	0.05	0.10	-0.06
Rutter Teacher Questionnaire	-0.03	-0.15	-0.32	0.27	0.12	0.15
Rutter Parent Questionnaire	-0.03	-0.02	-0.09	-0.06	-0.03	0.05
Needleman Questionnaire	0.04	-0.46*	-0.26	-0.10	-0.55*	-0.21
Observation of attentional be.	-0.30	-0.26	-0.16	0.33	0.28	0.28
Extent understood by teachers	0.48*	0.35	0.19	0.52*	0.20	0.25
Extent understood by parents	0.35	0.62*	0.17	-0.43	-0.08	-0.35
Use of signs/symbols to answer questions	-0.10	0.26	-0.06	0.38	0.09	-0.22
Use of signs/symbols to ask for objects	0.18	0.27	0.22	0.24	-0.03	-0.13
Use of signs/symbols to indicate needs	0.49*	0.41*	0.66**	0.40	0.24	-0.17
Use of signs/symbols in spontaneous conversations	0.62*	0.67*	0.41**	0.09	0.07	-0.26
Use of signs/symbols to comm. with teachers	-0.07	0.44*	0.16	0.36	-0.01	-0.05
Use of signs/symbols to comm. with parents	0.21	0.60*	0.03	0.47*	0.23	0.01
Use of signs/symbols to comm. with peers	0.30	0.29	0.25	0.00	0.24	-0.34

APPENDIX 38: Correlations Between the Outcome Measures of Spoken Language Ability and the Baseline Measures

	Bliss Users (n = 20)			BSL (Makaton) Users (n = 14)		
	Outcome Measures			Outcome Measures		
Baseline Measures	Reynell Expression	Total Spoken Utt.s	MLU	Reynell Expression	Total Spoken Utt.s	MLU
Columbia MMS	0.03	-0.07	0.01	0.33	0.18	0.01
Pre-symbol Assessment	-0.01	-0.05	-0.06	0.11	0.07	-0.16
Frostig - Form Perception	-0.23	-0.13	-0.17	0.42	0.45	0.02
Frostig - Position in Space	0.02	-0.06	0.01	-0.12	-0.10	-0.28
Severity of Physical Handicap	-0.18	-0.07	-0.28	-0.11	-0.15	-0.07
Mobility Scale	0.58*	0.36	0.55*	0.13	0.24	-0.17
Agility Scale	0.31	0.09	0.32	0.07	0.26	-0.24
Impairment of speech musc.	-0.36	-0.26	-0.45*	-0.32	-0.24	-0.36
Feeding difficulties	-0.32	-0.37	-0.50*	-0.31	-0.14	-0.30
Reynell Comprehension	-0.13	0.01	-0.04	0.40*	0.29	0.24
English Picture Vocab.	-0.18	-0.14	-0.05	0.63*	0.45	0.31
Symbolic Play Test	-0.12	0.07	-0.05	0.24	0.15	0.01
Gestural Comprehension	0.04	0.24	0.19	0.42	0.36	0.07
Gestural Expression	0.24	0.31	0.29	0.45	0.36	0.10
Motor imitation	0.49*	0.30	0.49*	0.56*	0.52*	0.30
Reynell Expression Scale	0.94**	0.66**	0.84**	0.90**	0.84**	0.90*
No. intelligible words	0.89**	0.66**	0.77**	0.90**	0.80**	0.84**
Verbal imitation	0.81**	0.49*	0.60*	0.64*	0.74**	0.67*

APPENDIX 38: cont.

Baseline Measures	Bliss Users (n = 20) Outcome Measures Reynell Expression	Bliss Total Spoken Utt.s	Bliss MLU	BSL (Makaton) Users (n = 14) Outcome Measures Reynell Expression	BSL Total Spoken Utt.s	BSL MLU
Dev. of sounds - total	0.82**	0.69**	0.72**	0.73**	0.70*	0.66*
Total spoken utt.s	0.74**	0.75**	0.63**	0.64*	0.78**	0.70*
MLU of spoken utt.s	0.83**	0.90**	0.83**	0.41	0.38	0.52*
Motivation to communicate	0.06	0.22	0.19	0.65*	0.57*	0.37
Symbols/signs understood	-0.19	-0.16	0.24	0.69*	0.71*	0.31
Symbols/signs produced	-0.17	-0.14	-0.22	0.69*	0.64*	0.25
Total symbol/sign utt.s	0.45*	0.18	0.28	0.42	0.44	0.06
MSLU	0.54*	0.35	0.51*	0.64*	0.43	0.34
No. symbol/sign multi-term utt.s	0.57*	0.25	0.40*	0.50*	0.23	0.26
No. symbol/sign spont. utt.s	0.46*	0.19	0.29	0.33	0.19	0.06
Months on BLiss/Makaton pre-study	-0.25	-0.14	-0.30	0.20	0.27	-0.13
Age when Bliss/Makaton teaching began	0.22	0.31	0.20	0.11	0.01	-0.03
Weekly teaching time	0.08	0.14	-0.15	0.25	0.25	-0.07
Additional weekly speech therapy	0.05	0.01	-0.07	0.01	-0.16	-0.10
Extent of exposure to symbols/signs at school	-0.18	0.01	-0.20	0.17	0.31	-0.07
Parent attitude to symbol/sign use	-0.17	-0.04	-0.03	-0.07	0.22	0.06
Extent of exposure to symbols/signs at home	-0.17	-0.17	-0.30	0.16	0.15	-0.19
Age	0.10	0.23	0.08	0.16	0.08	-0.06
Social class	0.03	-0.16	-0.05	-0.13	-0.05	-0.04
No. of siblings	-0.02	0.06	-0.03	-0.18	-0.33	-0.41

APPENDIX 38 cont.

Baseline Measures	Bliss Users (n = 20) Outcome Measures			BSL (Makaton) Users (n = 14) Outcome Measures		
	Reynell Expression	Total Spoken Utt.s	MLU	Reynell Expression	Total Spoken Utt.s	MLU
P-A-C Socialization Scale	0.13	0.08	0.21	0.61*	0.46*	0.39
Rutter Teacher Questionnaire	0.33	0.04	0.25	-0.43	-0.31	-0.30
Rutter Parent Questionnaire	-0.03	-0.08	0.02	-0.01	0.13	0.02
Needleman Questionnaire	0.30	0.14	0.22	-0.34	-0.18	-0.16
Observation of attentional be.	-0.25	-0.29	-0.15	-0.49*	-0.37	-0.40
Extent understood by teachers	0.20	0.34	0.20	0.23	0.43	0.09
Extent understood by parents	-0.01	0.01	-0.05	0.53*	0.24	0.30
Use of signs/symbols to answer questions	0.14	-0.07	0.06	0.24	0.37	-0.11
Use of signs/symbols to ask for objects	-0.09	0.08	0.02	0.40	0.49*	0.05
Use of signs/symbols to indicate needs	0.13	0.25	0.21	0.21	0.31	-0.26
Use of signs/symbols in spontaneous conversations	-0.06	0.14	0.01	0.55*	0.35	0.25
Use of signs/symbols to comm. with teachers	-0.06	-0.12	-0.08	0.37	0.57*	0.10
Use of signs/symbols to comm. with parents	-0.13	-0.13	-0.26	-0.03	0.15	-0.33
Use of signs/symbols to comm. with peers	-0.25	-0.19	-0.22	0.27	0.27	-0.17

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